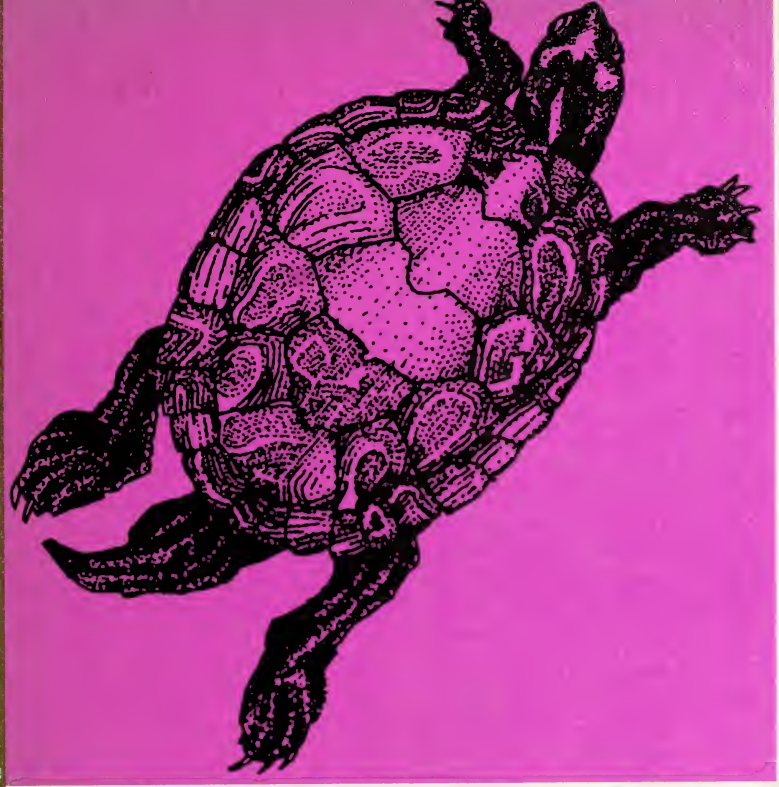

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Science for Tomorrow's World

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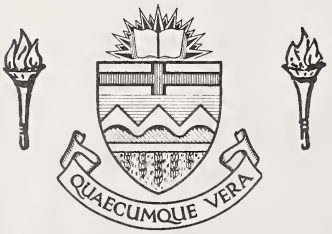

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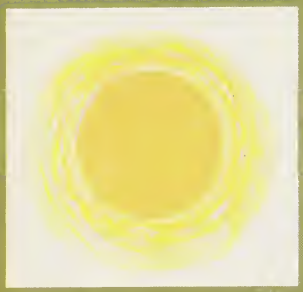

THE MACMILLAN SCIENCE SERIES

Science for Tomorrow's World 3

J. DARRELL BARNARD

CELIA STENDLER

BENJAMIN SPOCK, M.D.

GEORGE REYNOLDS, CONSULTING AUTHOR

THE MACMILLAN COMPANY, NEW YORK
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Authors

J. DARRELL BARNARD
CHAIRMAN, DEPARTMENT OF SCIENCE
AND MATHEMATICS EDUCATION
NEW YORK UNIVERSITY

CELIA STENDLER
PROFESSOR OF EDUCATION
UNIVERSITY OF ILLINOIS

BENJAMIN SPOCK, M.D.
PROFESSOR OF CHILD DEVELOPMENT
WESTERN RESERVE UNIVERSITY

GEORGE REYNOLDS
DIRECTOR OF PROGRAM
AND INSTRUCTION
UNION FREE SCHOOL DISTRICT #1
SCARSDALE, NEW YORK

Consultants

ISADORE HALPERN
BIOLOGY TEACHER
RICHMOND HILL HIGH SCHOOL
NEW YORK CITY

BOBBY J. WOODRUFF
SCIENCE TEACHER
RIDGEWOOD HIGH SCHOOL
RIDGEWOOD, NEW JERSEY

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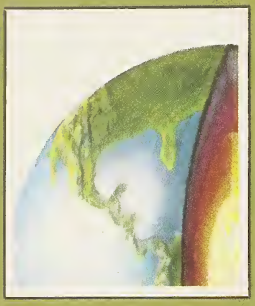

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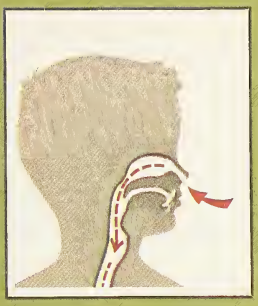

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The Scientist's Way

1

Being Curious

What You Will Find Out

Scientists are curious about the world. So are boys and girls. You will learn to use some of the scientist's ways to help you answer questions and find out about the world.

Being curious helps you learn about the world in which you live. When you are curious, you often ask questions. This book will show you how to find answers to some of your questions.

How Does Being Curious Help You to Learn?

Babies are curious. Almost every hour of every day they are learning something. How much have you learned since you were born? There are so many things that you have learned that you could fill many pages of notes with them.

Look at the first picture on the next page. There is a toy outside the baby's playpen.

The baby wants to play with the toy. How will he get it into his playpen? On the next page you see one way he might try.

That way does not work. He will try again. This time he turns the toy around.

Now the toy fits through the bars. What has the baby learned?

The way the baby learned is the same way that you learned when you were a baby. You tried something one way. If that way did not work, you tried another way. Soon you learned that some things will work only one way. You learned that other things will work many ways. You also learned that some things will not work any way at all.

Being curious can often help babies to learn. The baby was curious about the toy. Being curious helped him to learn how to get the toy into his playpen.

Being curious can also help animals to learn. Have you ever given a puppy a new toy? Does he sniff it, paw it, or lick it? Why do you think the puppy does this?

The monkey in the picture is hungry. He sees a banana. What will he do first?

What does he do next?

What is the monkey learning?

Babies and animals cannot think out questions in words. But you can. Good questions help you to find out things that are important to know.

Sometimes, the questions you ask may lead to other questions. Then you may learn more. What if you saw an insect crawling on a tree? You could ask, "What is that?" Someone might say, "It's a ladybug." Then you would know what it is, but you would still have a lot to find out. The answer to such a question leads to other questions. You could then ask a question such as, "How can the ladybug know which way to crawl?" Such a question would help you to learn more.

Are you curious about things? Do you ask your parents or teachers about these things? Do you ever try to find out on your own? How do you go about finding out on your own?

Mary's teacher told her class that it is easier to lift things in water than in air. Mary was curious about this. She asked, "If you lift something in water, won't it weigh more, because water is pushing down on it?" Mary asked her teacher, "Is it easier to lift a rock in water than in air?" The teacher asked how Mary could find out.

Mary thought for a moment. "Let us try lifting a rock in air and then lifting the same rock in water. We can find out which way the rock feels lighter."

While a pupil filled the classroom sink with water, Mary went outside and found a rock that felt heavy to her. When she got back, she put the rock in the bottom of the sink of water. Next, she tried to lift the rock. It felt lighter. But why did it feel lighter? Are you curious? How could you find out?

Just being curious is not enough. You must do something when you are curious. You must try to find the answers. You often find out by asking more questions, or by trying things out.

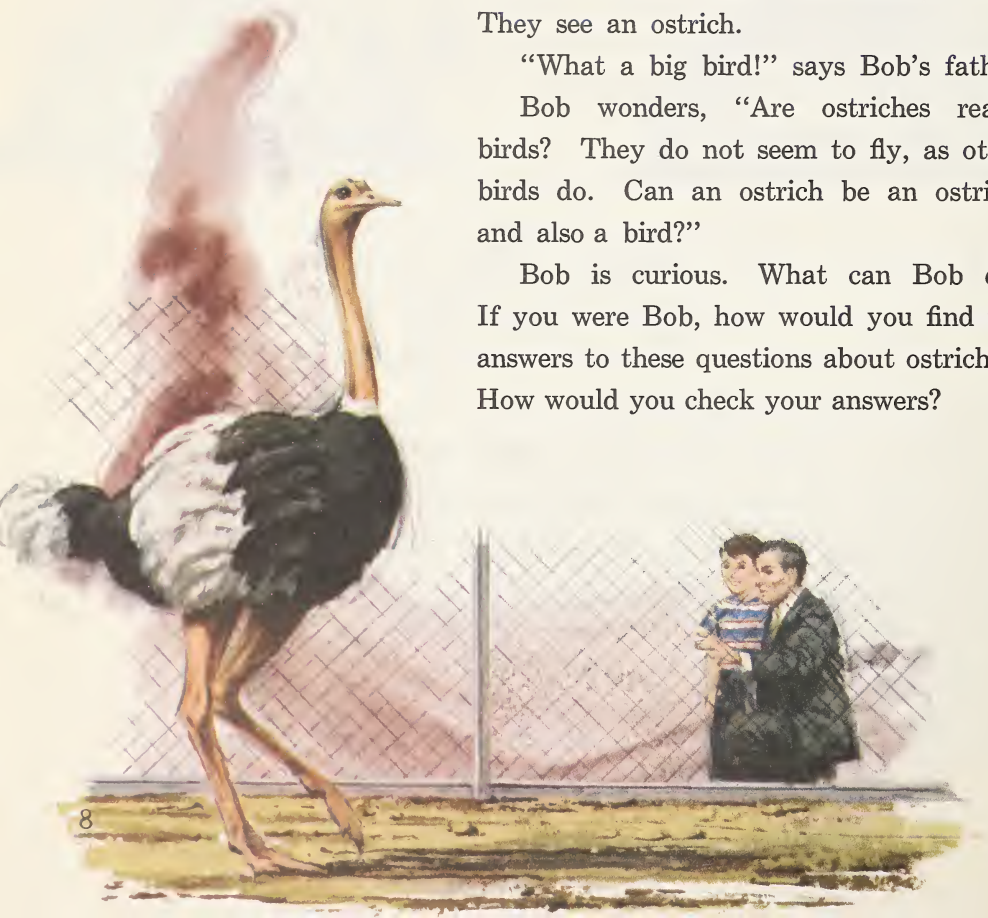
USING THE SCIENTIST'S WAY

Bob and his father are visiting a zoo. They see an ostrich.

"What a big bird!" says Bob's father.

Bob wonders, "Are ostriches really birds? They do not seem to fly, as other birds do. Can an ostrich be an ostrich, and also a bird?"

Bob is curious. What can Bob do? If you were Bob, how would you find the answers to these questions about ostriches? How would you check your answers?

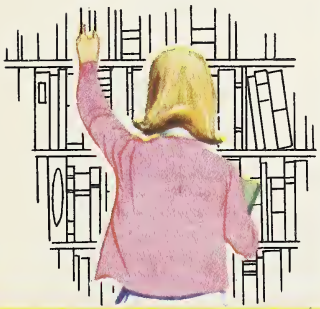


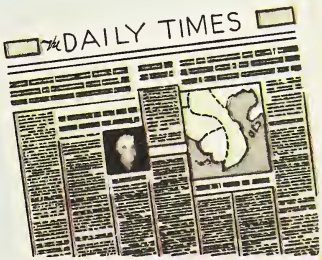
How Can You Find the Answers?

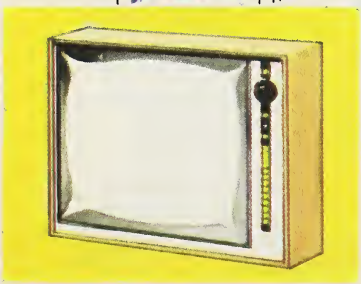
There are some questions to which you already know the answers. But to answer other questions, you may have to try things out.

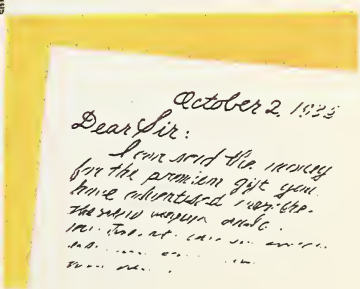
There are many ways to find answers to your questions. To answer most questions, you need a **source**. A source is anything that helps you find answers to questions.

Here are some sources that can help you find answers to your questions. In what ways can you use these sources to find answers?









Some sources are *good* sources. A person who knows much about something is a good source. When that person writes what he knows, his writings are a good source. Good sources help you find answers.

A girl in the third grade wondered how a caterpillar turns into a butterfly. What do you think would be the best way for her to find out?

1. Should she go to the school library to find some books about butterflies?

2. Should she write a letter to a museum of natural history? The people there know much about animals.

3. Should she ask a science teacher?

These sources are all good sources. The girl is likely to get a correct answer to her question from any of them. But which is the best source for her to use? Why?

As you study science, you will learn to find more answers by yourself. If you cannot find out by yourself, you can use a good source. If that source cannot help, you may have to look for another source.

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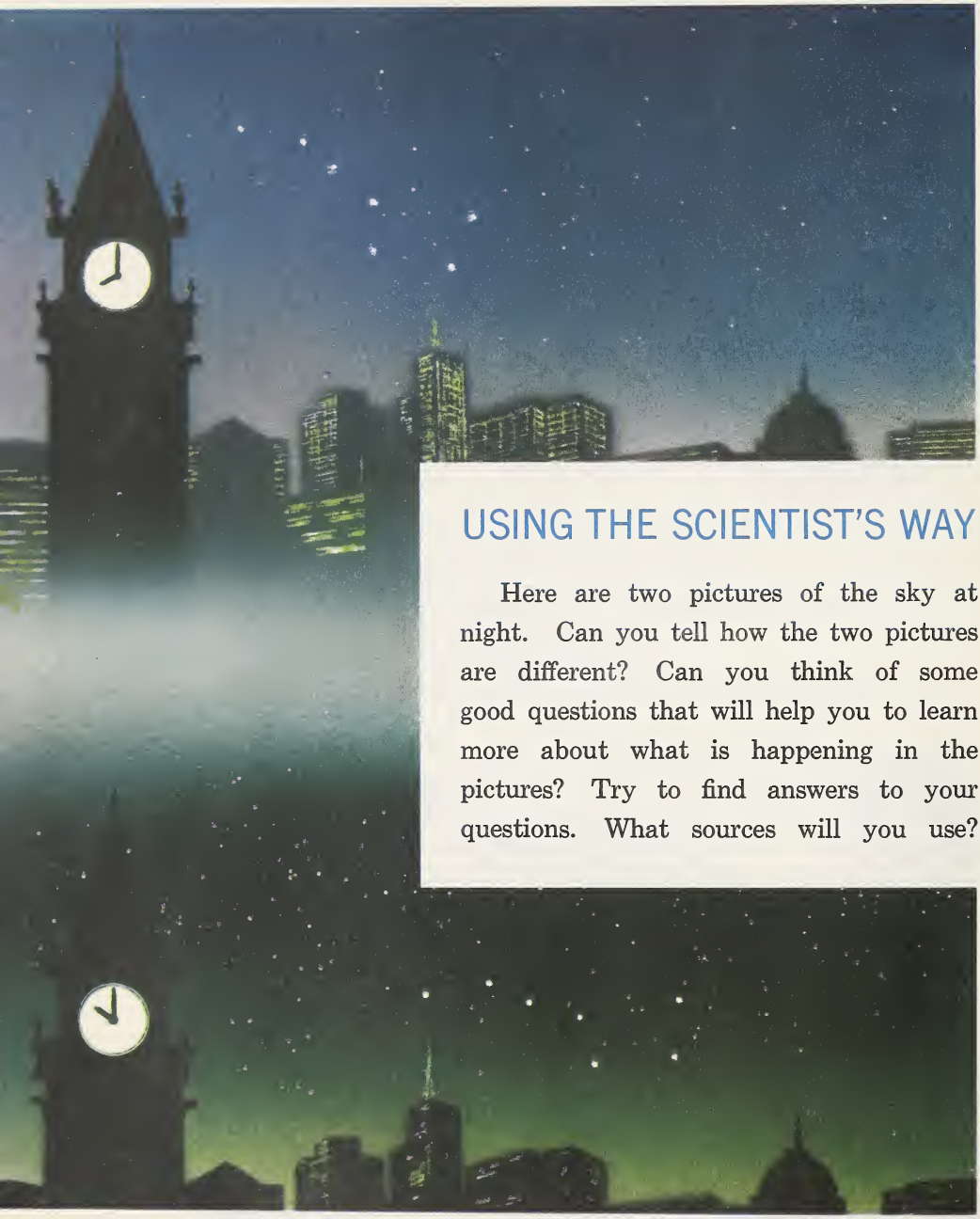
American Museum of Natural History
New York City
New York



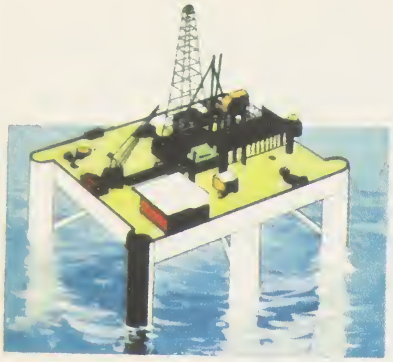
USING THE SCIENTIST'S WAY

Here are two pictures of the sky at night. Can you tell how the two pictures are different? Can you think of some good questions that will help you to learn more about what is happening in the pictures? Try to find answers to your questions. What sources will you use?

What Do Scientists Want to Learn?

Scientists ask many questions about the world. Scientists try to find out as much as they can about the world.

Today's scientists have many questions. They want to know how to keep people from getting sick. They want to know how plants and animals can live far away from the earth. They want to know what the smallest thing in the world is. They want to know more about the earth. These are only a few of the many things today's scientists are trying to learn about.



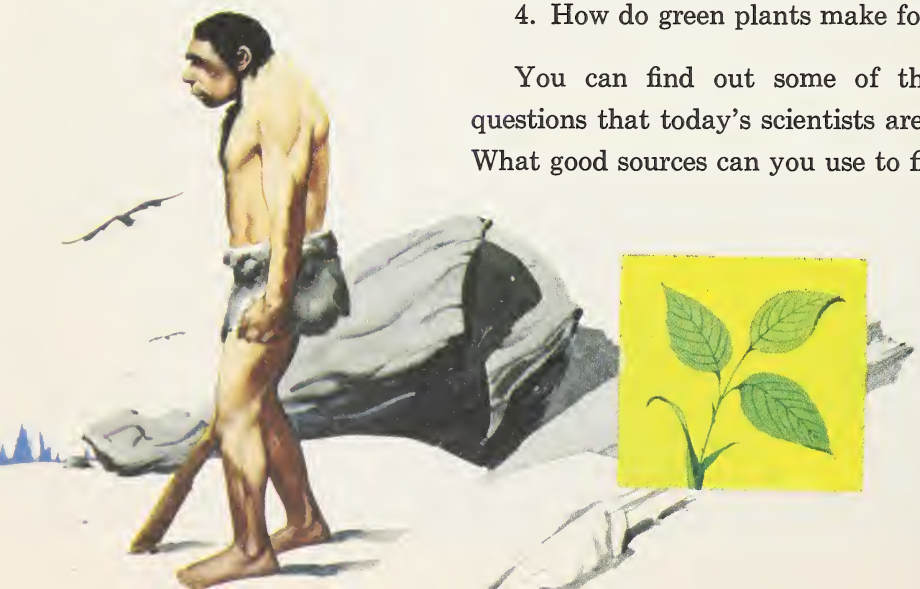
USING THE SCIENTIST'S WAY

Try to list four questions that today's scientists are asking about the world. You can use many good sources to find these questions.

One boy did this. He looked in some newspapers and magazines. He listened to scientists talking on the radio and on television. He learned that today's scientists are asking questions such as these:

1. What is it like far down in the earth?
2. Why do some animals live better in one place than in another place?
3. When did people first start living on the earth?
4. How do green plants make food?

You can find out some of the other questions that today's scientists are asking. What good sources can you use to find out?



How Do Scientists Find the Answers?

Scientists have many ways to find the answers to their questions. One way is to do an **experiment** (ik-SPEHR-uh-ment). An experiment is a way of looking for an answer by trying things out.

Scientists start an experiment by trying to guess the answer. The experiment shows whether the guess is right or not.

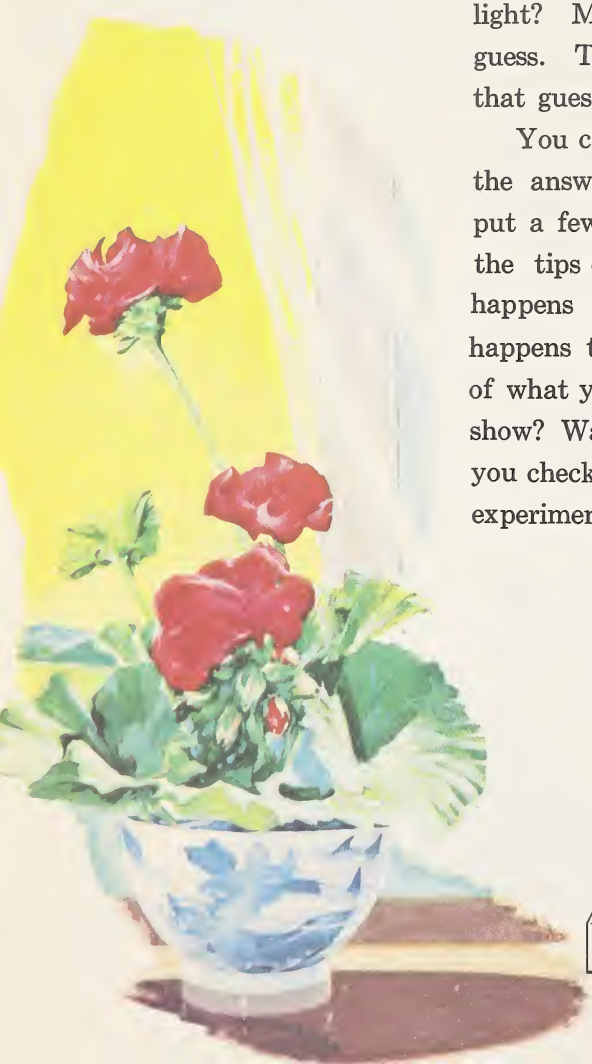
Scientists always try to be very careful when doing an experiment. They may do the same experiment again and again to be sure that they get the same answer each time. Then, when they think they have the right answer, they tell about it in scientific papers and magazines. Other scientists can then read about the experiment and try it.

Sometimes, the scientists find that the answer is not right. If this happens, they will have to try other experiments to find the right answer. It may take many experiments until the scientists find the right answer.

USING THE SCIENTIST'S WAY

Plants bend toward light. Do you think it is the stem that bends toward the light? Or do you think that it is the tip of the plant that bends toward the light? Make a guess. Write down your guess. Then write down why you made that guess. Next, do an experiment.

You can plant some grass seeds to learn the answer. When the grass has grown, put a few shoots in separate pots. Cover the tips of the grass in one pot. What happens to the covered grass? What happens to the other grass? Make notes of what you see. What does the experiment show? Was your guess right? How can you check the answer you get from your experiment?



What If a Scientist Finds a New Answer?

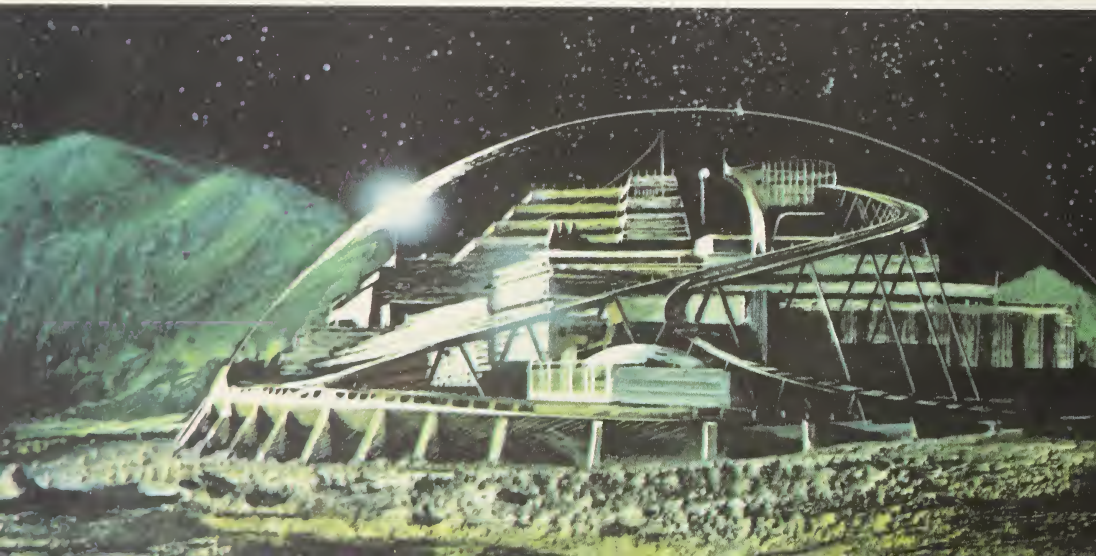
When a scientist is the first one to find the answer to a question, the answer that he finds is called a **discovery**. Scientists are making discoveries every day in all parts of the world. Every time a discovery is made, it helps all of the other scientists. It helps them to know more about the world.

Scientists have already made very many discoveries about the world. Scientists have discovered how to see many faraway stars in the sky. Scientists have discovered much about the first plants and animals on earth. Scientists have discovered how to grow better food plants such as corn, wheat, and potatoes. They have discovered how to stop some sicknesses. Scientists have made many discoveries, but there are still many more to be made. What discoveries do you think scientists will make in your lifetime? Do you think that someday a way will be found to keep all people from getting colds?

Do you think that someday scientists will learn what it is like on the moon?

Do you think that someday scientists will be able to make food without the help of green plants?

Do you think that someday our cities will be built under large, clear roofs so that it will rain only when we want it to rain?



You may want to be a scientist someday and help make discoveries for tomorrow's world. You may want to help all people to live better and to know more about the world. If you become a scientist, you may be able to do these things.

But even if you do not wish to become a scientist, you will still learn much when you learn science. Science helps you know more about yourself and about the world. Science helps you find the answers to many of your questions. Science will help you to think better. Science has already helped you if you have started to ask good questions.

USING THE SCIENTIST'S WAY

Look in newspapers and try to find stories about new discoveries in science. Look in different newspapers and see if each newspaper tells the same things about the same science discoveries. Tell your class what you find out. You might want to make a report called "Science Discoveries This Year."

Michael Faraday

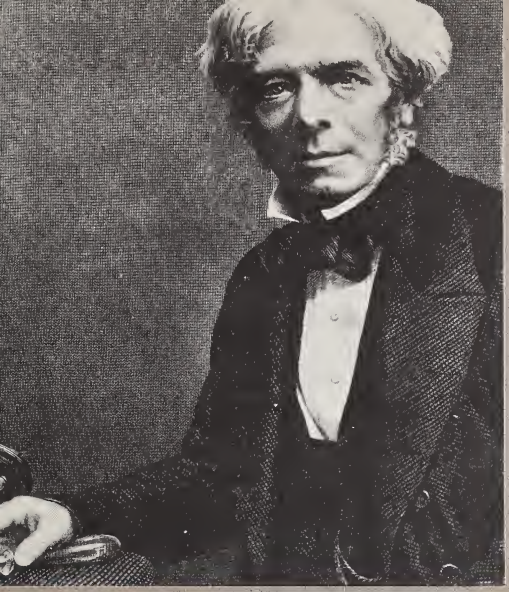
(1791–1867) ENGLAND

Michael Faraday was an English boy who came from a poor family. When he was thirteen years old, he had to leave school to work in a bookshop. There he read many science books. The more he read, the more questions he asked. Michael thought that he might want to be a scientist.

Michael went to hear some talks given by a famous scientist, Sir Humphry Davy. Michael was then sure he wanted to be a scientist. He showed Sir Humphry the notes he had taken of Sir Humphry's talks. A year later, when Sir Humphry needed a helper, Michael got the job.

As a scientist's helper, Michael Faraday could do experiments on his own. He knew, as other scientists did, that electricity can make magnetism. But he was curious and wanted to know more. He wanted to know, "Can magnetism make electricity?"

To find out, Faraday did an experiment. He put a magnet inside a coil of wire. Then he



used an instrument called a **galvanometer** (gal-vuh-NOM-uh-ter) to find a trace of electric current in the coil. He did this many times, but he found no trace of electric current.

Again Faraday asked questions. What if the magnet were moved in and out of the coil? He tried it and the galvanometer's needle flickered back and forth. Faraday had discovered that a moving magnet can produce an electric current in a wire.

Michael Faraday's discovery led to the invention of the electric **generator** (JEN-uh-ray-ter). A generator makes electricity. Today, there are many things that use electricity made by generators. Light bulbs, radios, televisions, refrigerators, and washers use such electricity.

Michael Faraday's curiosity and questions about electricity led to discoveries that are helping us today. He was a true pathfinder in the science of electricity.

Using What You Have Learned

1. Look at the things in the picture. Try to guess which things will float on water. Then put these things, one by one, into a glass of water. Which guesses were right?

2. Get two cardboard boxes that have different shapes. Both boxes should weigh the same when empty. Fill each box with sand. Now try to guess whether or not both boxes will weigh the same when filled with sand. Why did you make that guess? Weigh the boxes to see whether or not your guess was right.

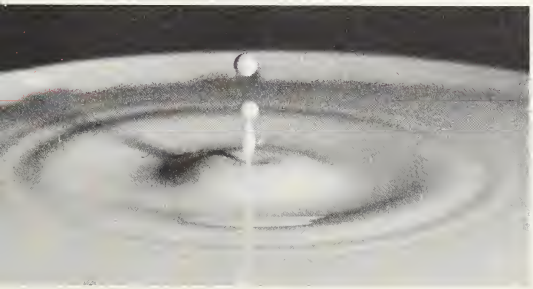
3. Below you will find four pictures. Look at them very carefully. Can you tell what they show? Now read the clues with each picture and make a guess about what you see. How will you go about finding out for sure what each picture shows? What questions will you have to ask to find out? Where will you go for your sources of information?

It spends much of its life eating.
As an adult it has wings and it flies.

It flows from sink faucets.

It is a warm-weather pest.

This is how it looks in slow motion.
This liquid is good with dry cereal.



WHAT YOU KNOW ABOUT

The Scientist's Way

What You Have Learned

When you are curious, you often ask questions about the world. Good **sources** can help you find answers.

A person who knows much about something is a good source. The writings of such a person are a good source. Library books are often good sources also.

Scientists ask many questions about the world. When good sources do not answer a question, a scientist may try to find the answer by doing an **experiment.** An experiment is a way of looking for an answer by trying things out.

When a scientist finds a new answer to a question, the answer is called a **discovery.** Other scientists then check the answer to see if it is right.

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

discovery experiment sources

Yes or No?

Number a page in your notebook from 1 to 4. For each sentence that seems true, write *Yes* on your paper. For each sentence that does not seem true, write *No*.

1. A good source helps you find answers to your questions.

2. A museum is a good source.

3. The school library is a very good source for you to use.

4. Experiments never help you to find answers to your questions.

Using Science Words

Number a page in your notebook from 1 to 3. Fill in the right word for each sentence.

library experiment source

1. A ___?___ is a very good source for you to use.

2. A person who knows much about what you want to know is a good ___?___.

3. An ___?___ is a way of looking for an answer by trying things out.

YOU CAN LEARN MORE ABOUT

The Scientist's Way

Guess the Word

1. Science books and many books in libraries are good CESSOUR.

2. An EXITPERMEN is a way of looking for an answer to questions by trying things out.

3. The scientist who is the first one to find the right answer to a question has made a VERYCODIS.

Science Newspaper

Your class can be a source of answers for other children. Your class can write a science newspaper. Some boys and girls in your class can talk to people who know about science. These boys and girls can write about what those people say. Other boys and girls can do some experiments in class and then write about the experiments for the whole class to read in the newspaper.

Question Writing

Good questions can often help you to find answers. Look at the names of the units in this book. Try to think of good questions that might be answered in each unit. Compare your questions with your classmates' questions. Choose the three best questions for each unit. When you read the book, see if these questions are answered.

You Can Read

1. *Research Ideas for Young Scientists* by George Barr. You can repeat scientists' discoveries.

2. *Where Does the Butterfly Go When It Rains?* by May Garelick. This book asks many good questions.

3. *A Book of Moon Rockets for You* by Franklyn M. Branley. This book tells you more about the moon.

2

The Sky Above

What You Will Find Out

Have you ever wondered, as you looked at the sky, what is out there? You will learn about the sun, the moon, and the planets. You will learn how man has found out about them.

Do you like to look up at the sky?
Do you like to see the many stars?
Did you ever try to count the stars?
You will learn more about the stars.
You will find out more about the sky.

How Big Is the Sky?

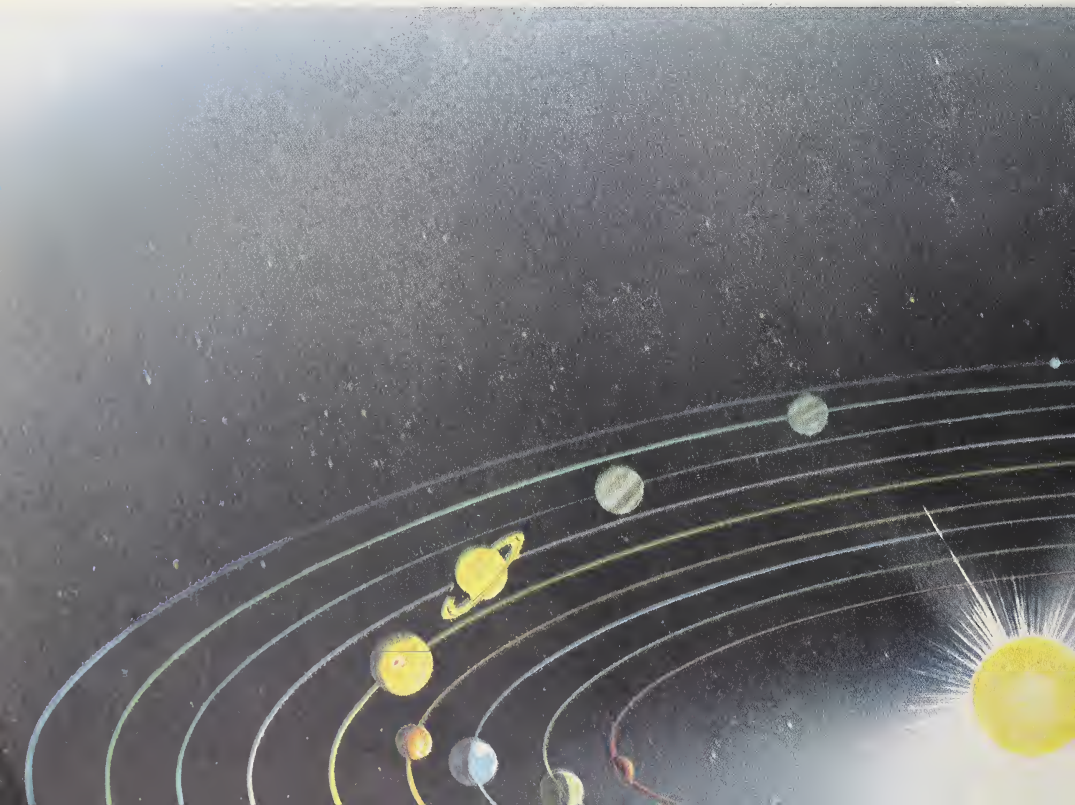
Do you think you could see all of the earth from a place like the one in the picture? You could not see the whole earth from such a place.

From far off in the sky, the earth would look like this.

From your faraway place in the sky, you would see that the earth makes a path around the sun. The earth's path around the sun is called an **orbit** (OR-bit). It takes one year for the earth to move in orbit around the sun.

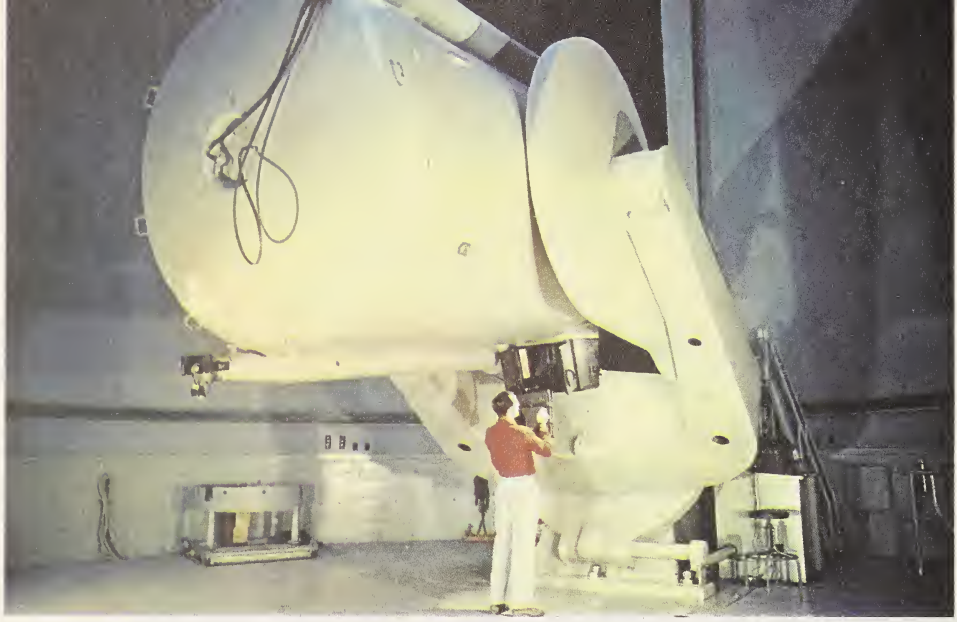
The earth is a **planet** (PLAN-it). A planet is one of the nine bodies that orbit around the sun and get their light from the sun. A planet's orbit is in the shape of an **ellipse** (ih-LIPSS). Look at the picture. How is an ellipse like a circle? How is it different from a circle?

The sun and its nine planets are called the **solar system** (SOH-ler). Look at the picture. See how the planets make orbits.



The sun is really a star. It is made of hot gases, like all the other stars. The sun and its planets are only a very small part of the much bigger family of stars called the **Milky Way Galaxy** (GAL-ak-see). A galaxy is made up of billions of stars like the sun.

Here is what scientists think the Milky Way Galaxy looks like. See the arrow that points to the solar system in the Milky Way Galaxy.



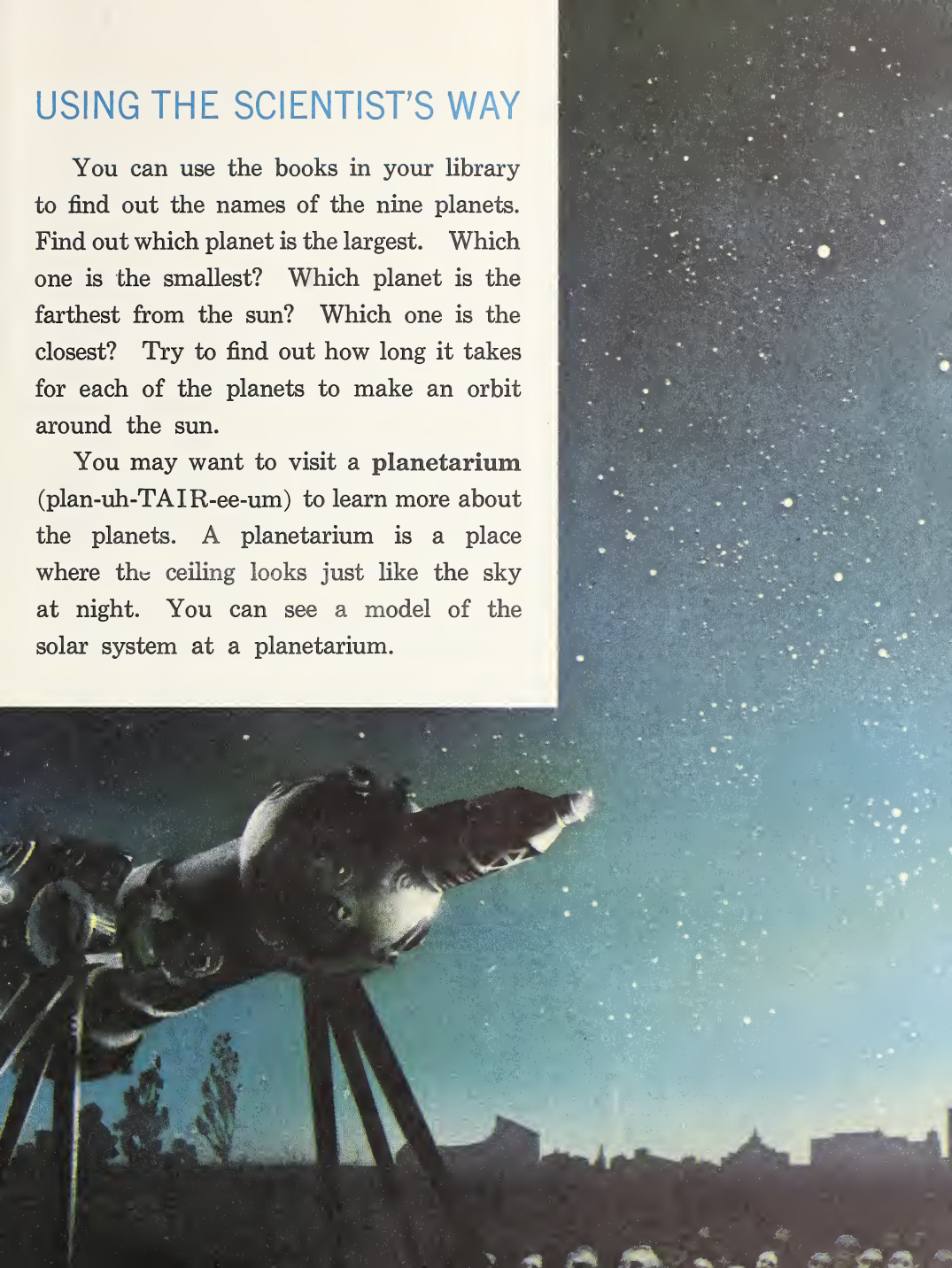
Even though the Milky Way Galaxy is very big, it is only one of millions of galaxies in space. Scientists use **telescopes** (TELL-uh-skohps) to see some of these galaxies. Telescopes make these faraway things in space seem much closer.

All galaxies in space are part of the **universe** (YOO-nuh-verss). The universe is made up of everything that there is. The earth and everything on it are part of the universe. The sky and the solar system and the Milky Way Galaxy are part of the universe.

USING THE SCIENTIST'S WAY

You can use the books in your library to find out the names of the nine planets. Find out which planet is the largest. Which one is the smallest? Which planet is the farthest from the sun? Which one is the closest? Try to find out how long it takes for each of the planets to make an orbit around the sun.

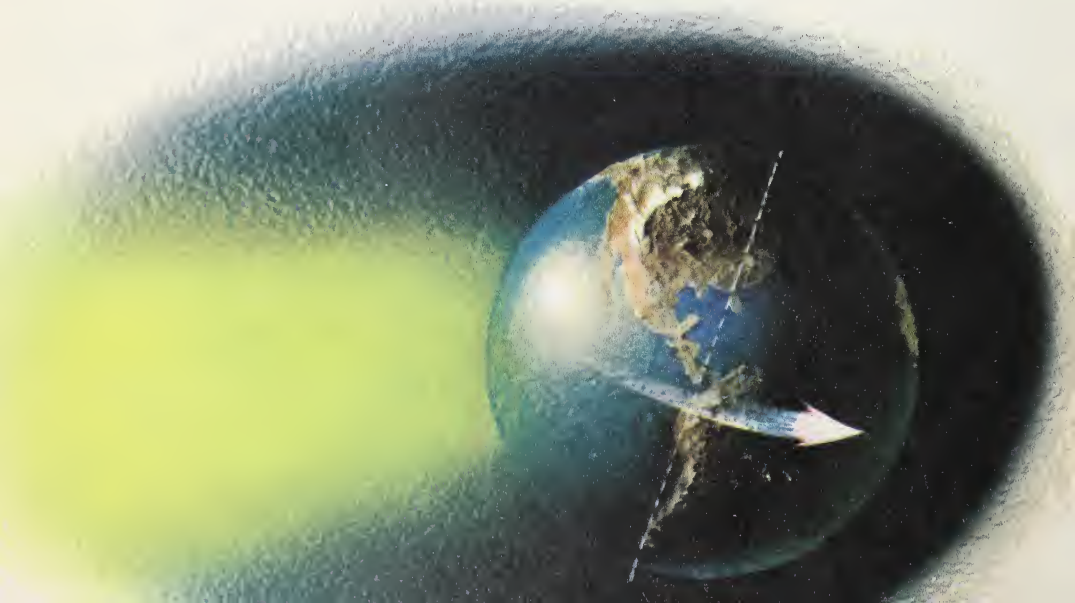
You may want to visit a **planetarium** (plan-uh-TAIR-ee-um) to learn more about the planets. A planetarium is a place where the ceiling looks just like the sky at night. You can see a model of the solar system at a planetarium.



Where Is the Sun at Night?

Each morning, the sun seems to rise in the sky. At noontime, it reaches its highest point in the sky. And then each night, the sun seems to go down on the other side of the sky. Where do you think the sun goes at night? Do you think that the sun stops shining at night?

To see what happens to the sun at night, think first about the earth. The earth turns around on an **axis** (AK-siss). The earth's axis is a make-believe line that goes through the middle of the earth. Look at the picture. See how the earth turns.



USING THE SCIENTIST'S WAY

You can see what the earth's axis is like. Take a small rubber ball. Push a needle into the ball. Now push a straight pin anywhere into the other side of the ball. Turn the needle and watch the pin.

Push another pin into the ball so that the second pin does not make as big a circle as the first pin.

Try to push other pins into the ball so that they go around in smaller and smaller circles. Can you find the place where a pin will not move around in a circle at all?

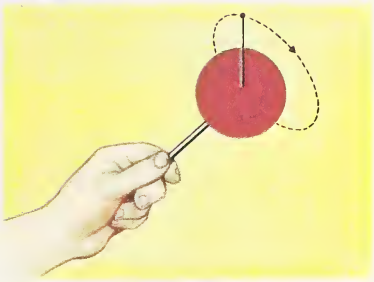
There is one place where a pin will not move in a circle. Make believe that there is a line through the ball from that pin to the needle. That make-believe line is the axis of the ball.

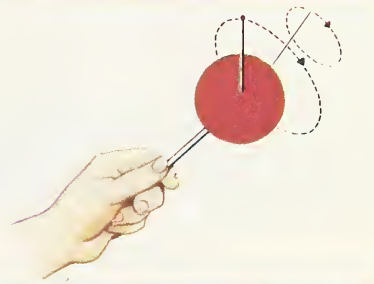
Now you can see for yourself where the sun goes at night.

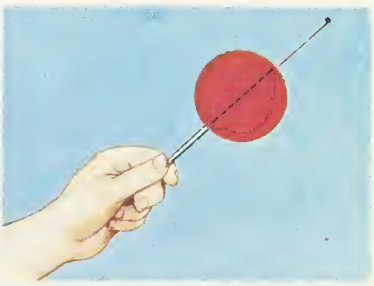
Take all the pins out of the ball. Cover the ball with some aluminum foil.

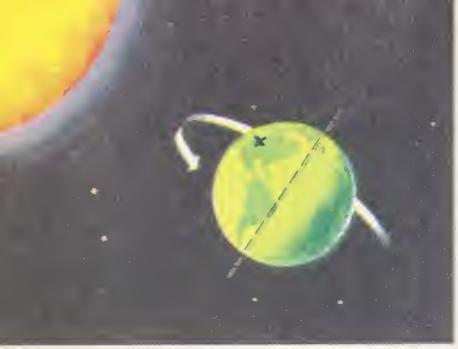
Then paste a small piece of paper on the ball. Make believe that the paper is the place on the earth where you live.

Put a lighted lamp on a table. Make believe that the lamp is the sun.









Now hold the ball near the lamp. Put out all the other lights in the room. Then turn the ball around on its axis.

While you are turning the ball on its axis, think about these questions:

1. Does the lamp keep shining?
2. Does it light up all of the ball at the same time?
3. Does the lamp always light up the piece of paper?

In the same way, the real sun keeps shining. The sun lights up only a part of the earth at a time. When your part of the earth is turned toward the sun, it receives the sun's light. When it becomes dark, your part of the earth is turned away from the sun.

Is the Sun the Brightest Star?

The sun shines with a very bright light. But the sun is not the brightest star. Why do you think the sun seems to be the brightest star?

USING THE SCIENTIST'S WAY

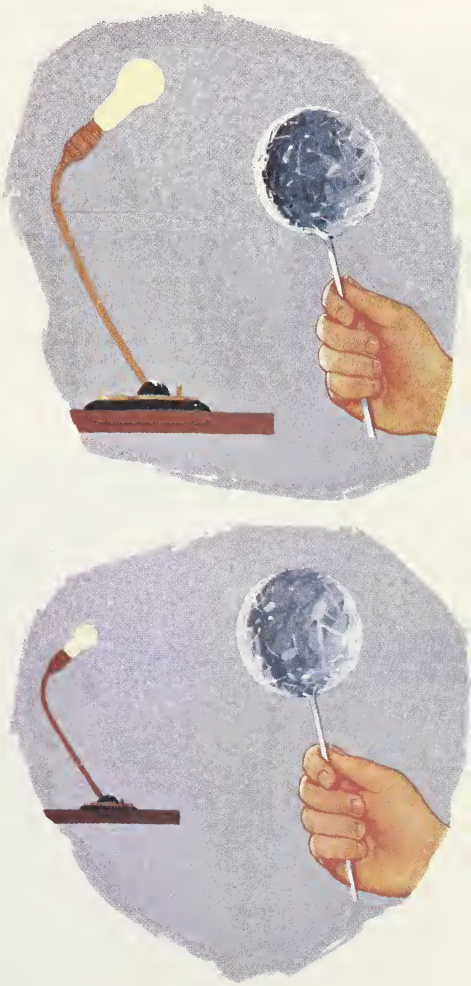
Use the needle and ball that you used before. Hold the ball about two feet from a lighted lamp. Pretend the ball is the earth and the lamp is the sun. Turn out all the other lights in the room. Does any light go from the lamp to the ball?

Now hold the ball far away from the lamp. Pretend that the lamp is a star that is much farther away. See how much light now goes from the lamp to the ball.

Which lights up the ball more, the "sun" or the "star"?

The real sun seems brightest because it is the closest star to the earth.

The sun is about 93 million miles from earth. But you would have to go much farther to get to the next star.

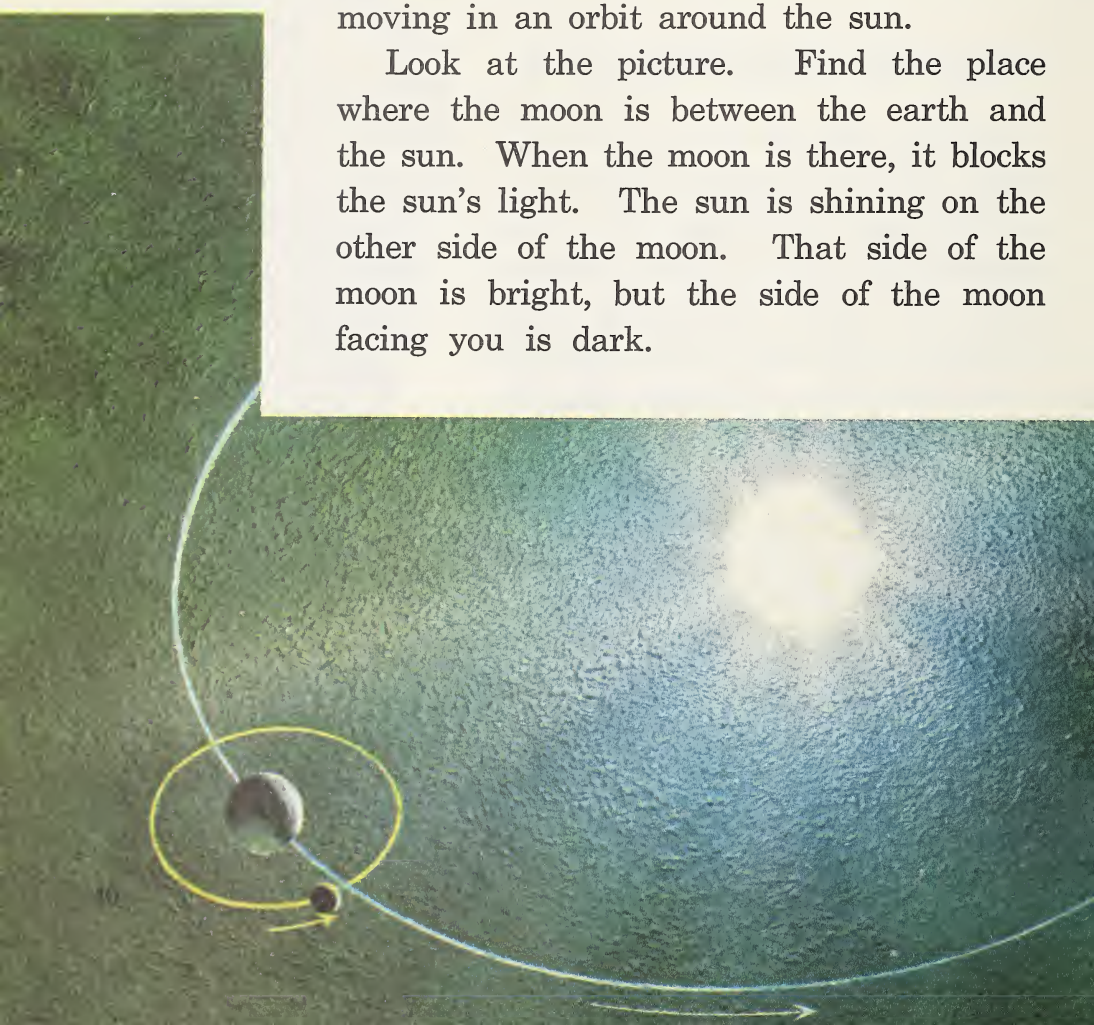


Why Is the Moon So Bright?

The moon orbits the earth. It takes about one month for the moon to make one orbit.

At the same time that the moon makes an orbit around the earth, the earth is moving in an orbit around the sun.

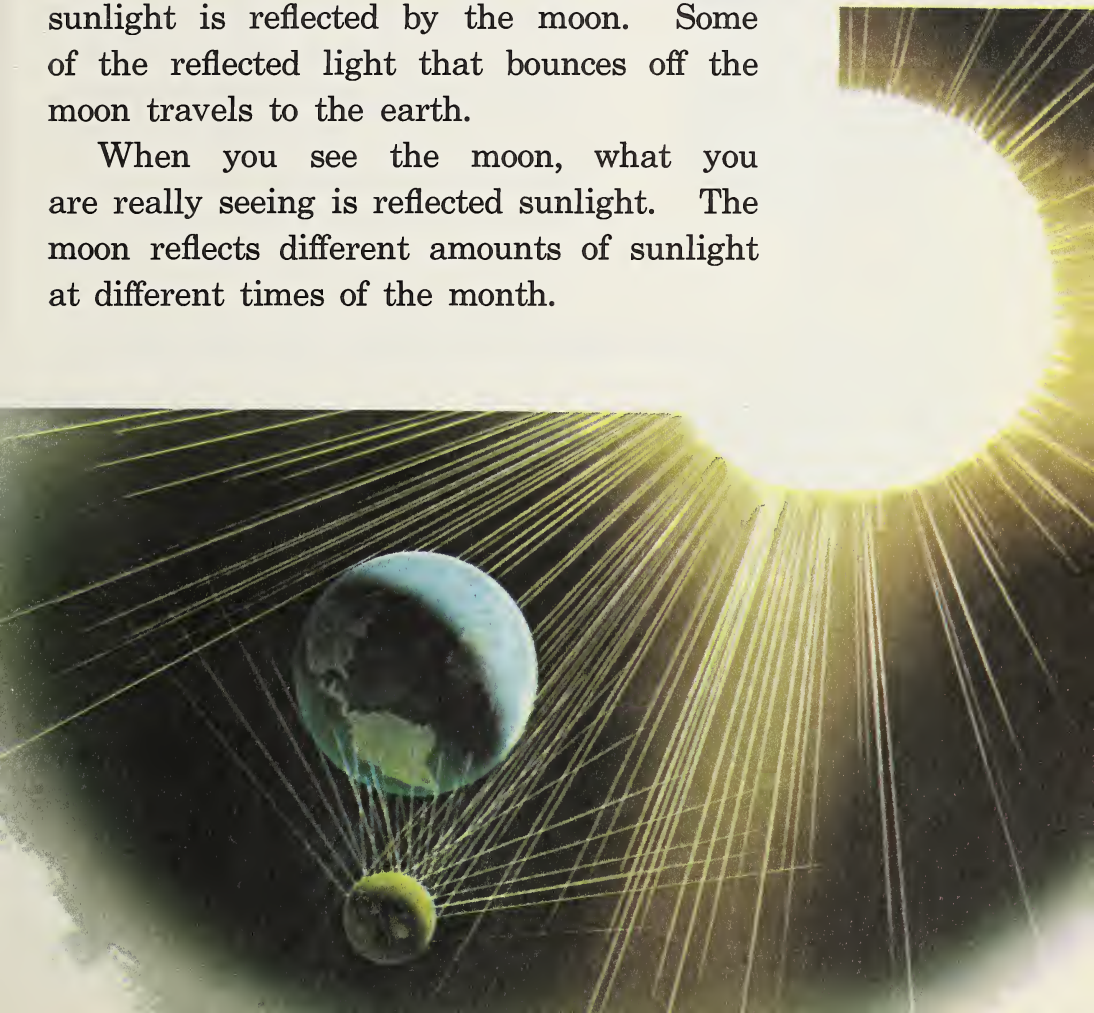
Look at the picture. Find the place where the moon is between the earth and the sun. When the moon is there, it blocks the sun's light. The sun is shining on the other side of the moon. That side of the moon is bright, but the side of the moon facing you is dark.



The moon is not a star. It does not give off any light of its own. It gets its light from the sun. The moon **reflects** some of the light of the sun. Reflected light is light that is bounced. Here is how the moon reflects the light of the sun.

First the sunlight hits the moon. The sunlight is reflected by the moon. Some of the reflected light that bounces off the moon travels to the earth.

When you see the moon, what you are really seeing is reflected sunlight. The moon reflects different amounts of sunlight at different times of the month.



USING THE SCIENTIST'S WAY

Cover a small ball with aluminum foil. Hold the ball above you, as you see in the picture. Make believe that the ball is the moon and that you are the earth.

Have someone turn on a lamp behind you. Make believe the lamp is the sun. Turn out all the other lights in the room. Can you see light reflected by the ball?

In the same way, the real moon reflects some of the light from the sun.

Is the Moon As Big As the Sun?

When you see the moon and sun in the sky, the moon seems to be about as big as the sun. But the sun is really much bigger than the moon.

The moon seems as big as the sun because the moon is much closer to the earth than the sun is. Often smaller things that are close to us seem to be as big as larger things that are far away.

USING THE SCIENTIST'S WAY

Cut out a big round piece of paper, about two feet across. Use a clear tape to hold the paper to the wall.

Then cut out a smaller paper circle that is about five inches across. Go to the other side of the room and hold the smaller piece of paper in front of you.

Does the smaller piece of paper seem as big as the larger one?

In the same way, the moon seems as big as the sun because the moon is so much closer to the earth.

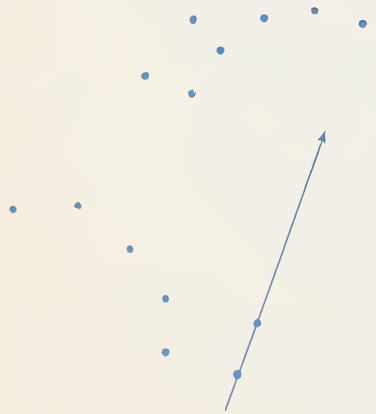
Which Star Is Which?

Long ago people thought groups of stars looked like pictures. We call such groups **constellations** (kon-stuh-LAY-shunz).

One of the constellations is the **Big Dipper.** These stars look like a big pan with a long handle.

There are many other constellations in the sky. One constellation looks very much like the Big Dipper. But it is smaller. This other constellation is called the **Little Dipper.** One of the stars in the Little Dipper is called the **North Star.**

USING THE SCIENTIST'S WAY



The North Star is always in the north. Look at the stars. You will see that all of them except the North Star seem to move across the sky. Long ago, sailors used it to find their way across the seas. When the sailors pointed toward the North Star, they were pointing north.

You will find that the stars in the bowl of the Big Dipper point to the North Star.

Where Are the Stars in the Daytime?

On a clear night, the sky seems filled with stars. But where are they in the daytime? Do they go away? Do they stop shining?

USING THE SCIENTIST'S WAY

Put a lamp on a table in your classroom and turn it on. Then turn off all the other lights in the room. Cover the windows so that no sunlight can come into the room.

Make believe that the lamp is a star. Can you see the star very well?

Now turn on all the lights in the room. Uncover the windows. Hold the lamp near the window. Can you see the lamp well?

In the same way, you can see the stars very well when your side of the earth turns away from the sun. Then the sky is dark.

But when your side of the earth turns toward the sun, it is daytime where you are. Then you cannot see the stars because the sun's light is so bright.

How Do Scientists Learn About the Sky?

People have always been curious about the sky. They learned a great deal about the sky. But they had no tools to help them see the faraway things in the sky.

Today, scientists use telescopes to make these faraway things in the sky seem much closer. Scientists often take pictures through telescopes. Here are some pictures that were taken with the help of telescopes.

Scientists also have other ways to learn about the universe. One of these ways is to send **rockets** into the sky. Cameras on rockets can take pictures of the sky and the earth. Here is a picture of the earth taken from rockets.

Sometimes the rockets are made in a way that will keep them going around and around the earth. Such rockets are called **satellites** (SAT-uh-lyts). These satellites make orbits around the earth.

The people who travel in spacecraft attached to rockets are called **astronauts.** They help scientists to learn about the sky. Scientists learn from the astronauts how people can live in space, far from the earth.

Scientists are learning how much food and air will be needed. Scientists are learning what kinds of clothes people who travel in spaceships will need to wear. Scientists are also learning how people will feel so far away from the earth.

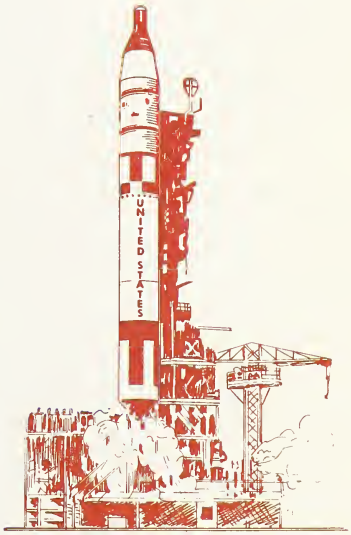
It is very hard to send a rocket into the sky, because the earth pulls on the rocket. The earth's strong pull is called **gravity** (GRAV-uh-tee). Gravity pulls everything toward the middle of the earth.

USING THE SCIENTIST'S WAY

Jump a short way off the ground. Do you come right back down again?

Now jump off the ground as high as you can. Push hard with your legs. Do you still come right back down again?

You see how hard it is for you to move away from the earth. A rocket is much bigger than you are. A rocket has to push much harder to move away from the earth. Can you think of other ways to show gravity in action?



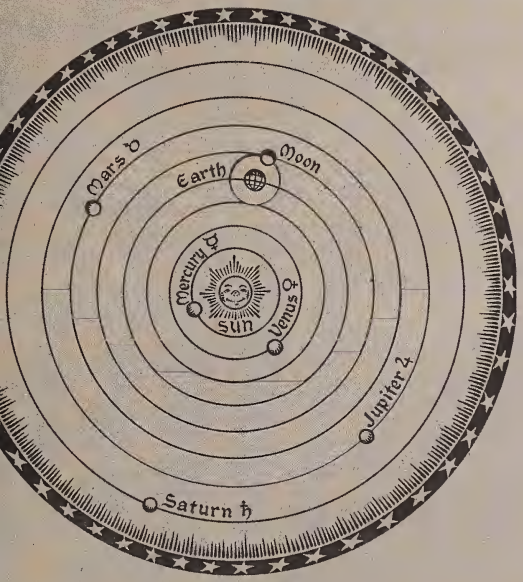
Nicolaus Copernicus

(1473–1543) POLAND

As you look at the sky at night, you can see the moon, the stars, and the planets. It seems as if the earth is at the center of the universe. It seems as if everything in the sky moves around the earth. In the daytime, it also seems as if the sun moves around the earth.

For hundreds of years, people believed that the earth did not move. They believed that the earth was at the center of things. They believed that the sun, moon, stars, and planets moved around the earth.

But about 400 years ago some people who watched the skies began to make discoveries. They observed many things that did not fit in with the idea of our earth as the center of the universe. They discovered more about how far away the sun and stars are. They knew that faraway things seem to move very slowly even when they are going fast. They knew that when we are moving, things look different to us than when we are standing still. For example, when you ride on a merry-go-round the crowd seems to whirl by you.



An astronomer named Nicolaus Copernicus (koh-PER-nih-kuss) did much reading, thinking, and observing about the new discoveries. He searched for a new idea to explain what happens in the sky. He wanted the new idea to explain all the things, new and old, that were known. In 1543, he published a book about his new idea. He surprised many people by saying that the sky does not move. Rather, he said, the earth turns on its axis and, at the same time, makes an orbit around the sun. He showed that planets other than the earth also go around the sun.

Copernicus did his work without a telescope. Yet much of his work is still accepted even after four hundred years. Copernicus was a pathfinder who changed man's thinking about the universe.

Using What You Have Learned

1. You can learn more about some of the constellations. Try to find books about the constellations. Draw pictures of the constellations that you find. See if you can find these constellations in the sky at night.

2. Maybe someone in your town will let you use his telescope or pair of **binoculars** (bih-NOK-yuh-lerz). Use the telescope or binoculars to look at the moon. Draw a picture of what you see.

3. Write a story about the astronauts. Tell how they are trying to get to the moon. Tell what clothes the astronauts wear when they go in the spacecraft attached to rockets. Tell what foods the astronauts eat. Tell how they move inside the spacecraft. Try to use good sources for your story.

WHAT YOU KNOW ABOUT

The Sky Above

What You Have Learned

The star called the sun and its nine **orbiting planets** make up the **solar system,** which is part of the **Milky Way Galaxy.** There are millions of galaxies in the **universe.**

The earth turns on its **axis** as it orbits the sun. The moon **reflects** sunlight while orbiting the earth.

Scientists use **telescopes** to look at the sky and see **constellations** such as the **Big Dipper.** The **North Star** is part of the **Little Dipper.**

Astronauts travel in the sky in spacecraft sent up by **rockets.** Rockets and spacecraft that orbit the earth are called **satellites.**

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

astronaut	ellipse	orbit	rocket
axis	gravity	planet	telescope
Big Dipper	North Star	reflect	universe

Yes or No?

Number a page in your notebook from 1 to 5. For each sentence that seems true, write *Yes* on your paper. For each sentence that does not seem true, write *No.*

1. Satellites help scientists learn about the sky.
2. The Milky Way Galaxy has ten stars in it.
3. The planet earth is part of the solar system.
4. The sun orbits the earth.
5. The North Star is part of the Little Dipper constellation.

Using Science Words

Number a page in your notebook from 1 to 5. Fill in the right word for each sentence.

gravity orbit planet star universe

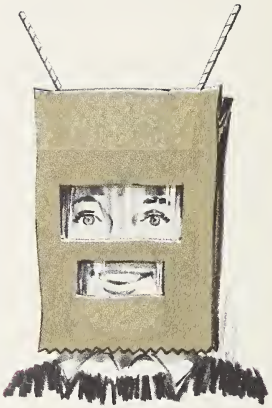
1. The ___?___ is made up of everything there is.
2. The sun is a ___?___.
3. The earth's strong pull is called ___?___.
4. The earth is a ___?___.
5. Each of the planets makes an ___?___ around the sun.

YOU CAN LEARN MORE ABOUT

The Sky Above

A Trip to the Moon

Everyone in your class can plan a make-believe trip to the moon. Some of the pupils in the class can find out what foods are needed. Other pupils can make a model rocket. The picture shows a model of a space helmet made from a paper bag and some cellophane.



You Can Read

1. *The Big Dipper* by Franklyn M. Branley. This book tells about the Big and Little Dippers.

2. *The True Book of Moon, Sun and Stars* by John Lewellen. This book tells more about gravity and how the earth turns.

3. *What Is a Solar System?* by Theodore W. Munch. Read about what scientists have learned about the solar system.

Guess the Word

1. An _ _ ? _ _ is the path that the earth makes around the sun.

2. Nine _ _ _ ? _ _ _ orbit the sun.

3. The sun and nine planets are called the _ _ ? _ _ _ _ ? _ _ _ .

4. A _ _ _ _ ? _ _ _ _ makes faraway things in the sky seem closer.

AROLS SYSMET

BITOR

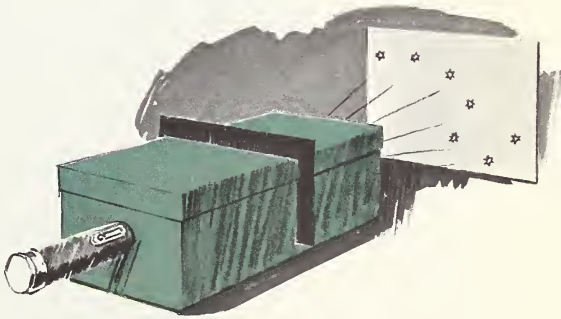
EPOCSTEEL

STENALP

Build a Constellarium

Use aluminum foil to cover the inside of a cardboard shoe box. Tape down the lid of the box. At one end of the box, cut a hole that is big enough for a flashlight. In the middle make a slit. Cut out the other end of the box.

For each of the stars in a constellation, punch a hole in a sheet of black cardboard. Then put the sheet into the slit and shine the flashlight on it.

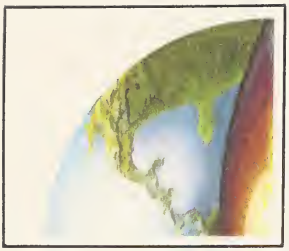


3

Our Planet Earth

What You Will Find Out

For more than a million years man has lived on the planet earth. He has learned much about it, as you will too. You will find out what is on, over, and even inside the planet earth.



Scientists believe that the earth has changed. They say that it was once very different from the way it is now. There are many signs that can help scientists see changes in the earth.

How Does the Earth Change?

Many, many years ago a farmer saw a small crack in the soil of his cornfield. It was only a few inches deep, not very wide, and about as long as your classroom.

During the spring of that year, it rained very hard. The rain broke up the soil. Slowly, the soil broke away from the sides of the crack. The crack got wider.

Water ran down along the crack, from the high ground to lower ground. Each time there was rain, the crack became deeper.

The years went by, and the farmer's son took over the farm. Each year the crack became wider and deeper and rain water carried away more soil from its sides.

Years later the farmer's grandchildren took over the farm. Their children did not see a crack in the field. The crack had become so wide and deep that it was now a gulley that went to another field.

After many more years, the gulley turned into a stream. Many more years passed, and the stream became still wider and deeper. A part of the earth had changed.

The story of our planet earth is a story of change. The earth is changing all the time, sometimes slowly and sometimes quickly.

Snow and ice can change the earth quickly. They can slide down a hillside in a great rush, carrying along with them rocks, trees, and soil. When the slide is over, the hillside has been greatly changed. Where do the rocks go? Where does the soil go?

Water changes the earth quickly. Have you ever been at the seashore during a storm? Giant waves hit against the shore. The waves carry away bits of rock and sand. The shore is not the same after

the storm. A part of the earth is changed.

Water also changes the earth slowly. The water in the sea does not run down into another sea. It stays right where it is. Rivers carry soil into the sea. The soil falls to the bottom of the sea near the place where a river meets the sea. The soil piles up. How will the earth change where the river enters the sea?

A change in one part of the earth causes a change in another. Water can slowly wear away the land in one place and slowly build up the land in another place.

Winds change the earth. Can you think how winds change the earth?

USING THE SCIENTIST'S WAY

After a rain, look in the street for a little stream of water. Does the little stream carry away any soil? How does the water look? Take a glassful of the water and let it run through a filter paper. What is left on the paper?

Does clear water from a hillside stream have bits of anything in it? If you can find some hillside water, filter it to find out.

Make a model like the one you see here. Put sand and soil in layers. This will be your hill. Have a "sea" at the edge.

Make a small crack in the hilltop. Make "rain" fall on your hill each day with a sprinkling can.

Write down how the hill changes every day. Where does the hill go?

You can see how freezing water changes the surface of the earth. When water freezes, the ice takes up more room than the water did.

Water may push on things as it freezes. Freezing water can push bits of rock and soil. Freezing water, over long periods of time, can push great amounts of rock and soil.

You can see how freezing water pushes on things. Fill a flat-sided medicine bottle with water. Screw on the bottle cap. Be sure that the bottle is filled to the top. Then wrap the bottle in a paper bag. Put the bag into a freezer overnight. Wear gloves to open the bag the next morning. What do you find out about the bottle? What does this tell you about freezing water?

Matter and Time

Scientists have a name for the stuff of which things are made. Scientists call it **matter.** Matter is anything that takes up space. Rocks are made of matter. Water is made of matter. Air is made of matter.

You can see that a rock takes up space. You can see that water takes up space. It is hard to see that air takes up space, because you cannot see air. But try to close a car door when all the windows are closed. That is hard to do because the car is full of air. The air in the car is matter, and it takes up space.

Hold an empty glass upside down. It is easy to move it up and down in the air. But it is hard to push the empty glass into a sink of water. What does this tell you about the air in the glass?

Matter can change. Over a long time, it may change a great deal. *But matter does not disappear.* A big rock can be broken into small pieces. But even the smallest piece takes up space. And all the small pieces together take up *the same amount of space* that the big rock took up.

Most changes in the earth's matter happen so slowly that you do not know they are happening. Scientists look for signs of changes that happened long ago. Have you ever seen such signs?

Some of the mountains in Wyoming have steep sides made of chalk. Chalk is made from the bodies of tiny sea animals. But Wyoming is far from the sea. What does this tell you about Wyoming? How has the earth there changed?

Not long ago, an unusual rock was found in Kansas. Parts of a dead fish were pressed into the rock. But such a fish does not live in the seas today. What does this tell you about changes in living things on earth?

In New York State, remains of corals have been found in the earth. Corals are small sea animals that live in warm waters, such as the waters near Florida. What does this tell you about the way New York State has changed?

USING THE SCIENTIST'S WAY

All gases take up some room. You can see for yourself that this is so.

Put a quart bottle on a table. The bottle has some air in it. The air is a gas. You can show how this gas takes up room.

Use some moist clay to make a bottle top. Make the bottle top big enough to cover the top of the quart bottle.

Use a pencil to make a small hole in the bottle top. Then put a funnel through the hole.

Put the funnel and bottle top on the bottle. Be sure that the bottle top fits very tightly on the bottle. Be sure that there are no holes between the bottle top and the funnel.

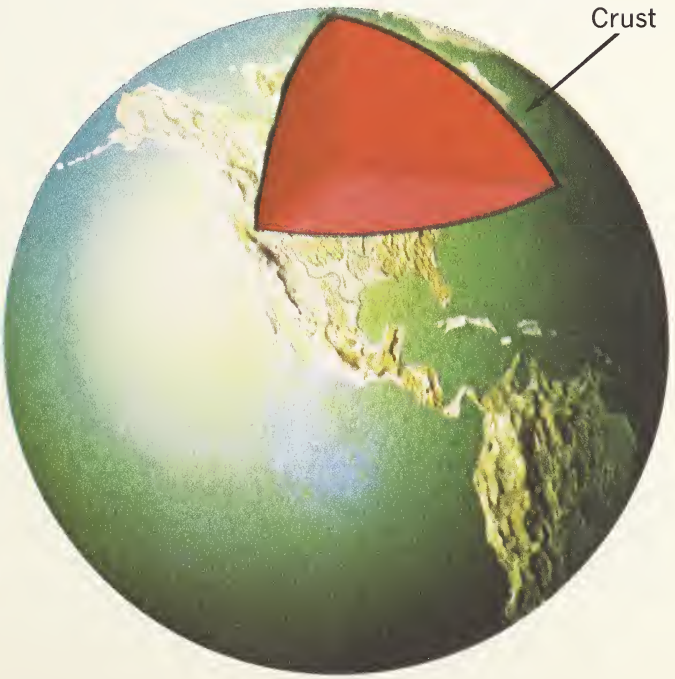
Let some water fall quickly into the funnel until the water comes right up to the top of the funnel.

What holds up the water in the funnel?

What Is It Like Inside the Earth?

Scientists believe that the earth is made up of four parts.

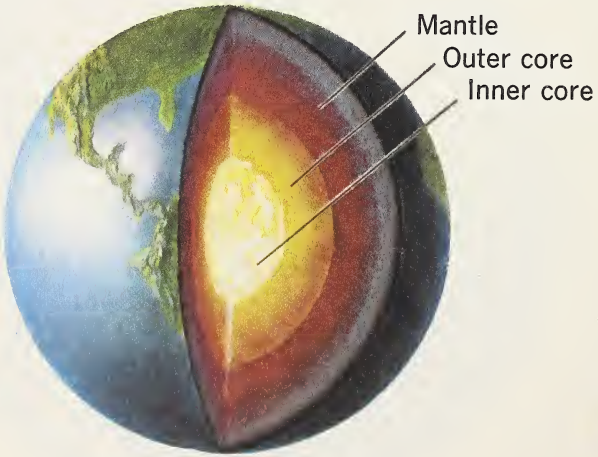
The outside covering all around the earth is called the **crust.** The crust is the part with all the seas and the land on it. Your school is on the crust of the earth. Your home is on the crust. All plants and animals live on the crust. You live on the crust of the earth.



Under the earth's crust is the **mantle.** Scientists think that the mantle is made of very hard rock. Scientists say that the rock of the mantle is much harder and heavier than any rocks in the crust.

Below the mantle of the earth is the part called the **outer core.** Scientists believe the outer core is very hot. They believe it may be almost like a **liquid.** A liquid is anything that flows. Scientists believe the outer core is made of very hot liquid-like iron and nickel.

Deepest inside the earth is the **inner core.** Scientists think that the inner core is solid nickel and iron.



USING THE SCIENTIST'S WAY

You can make a model of the earth.

First make a little ball out of colored clay. The ball should be about as big as a grape. Make believe that this ball is the *inner core* of the earth.

Then take a piece of clay that is a different color. Mold it around the first ball. This other layer should make the ball about the size of an egg. Make believe that this new layer is the *outer core* of the earth.

Use some more of the first color clay to make a layer that goes around the outer core. This layer should make the ball about the size of a grapefruit. Make believe this layer is the *mantle* of the earth.

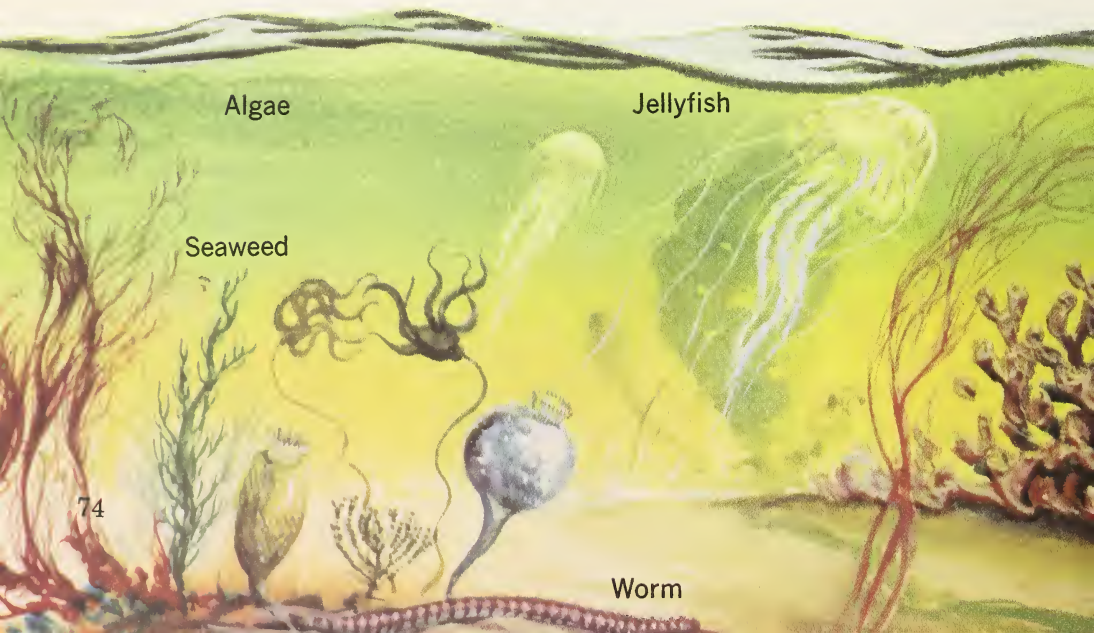
Then put a piece of aluminum foil all around the mantle. Make believe that the aluminum foil is the *crust* of the earth. You are using aluminum foil for the crust because the crust of the real earth is the thinnest layer of the earth.

Now carefully cut the ball in half. What do you see? Do you see an *inner core*? Do you see an *outer core*? Do you see a *mantle*? Do you see a *crust*?

Have Living Things Always Been the Same?

Scientists believe that long ago there were very few living things on earth. Scientists believe that small green sea plants called **algae** (AL-jee) were among the first living things. Algae do not have leaves, stems, or roots.

Long, long after the first algae appeared some sea animals came into being. Among these sea animals were **sponges**, jellyfish, and worms.



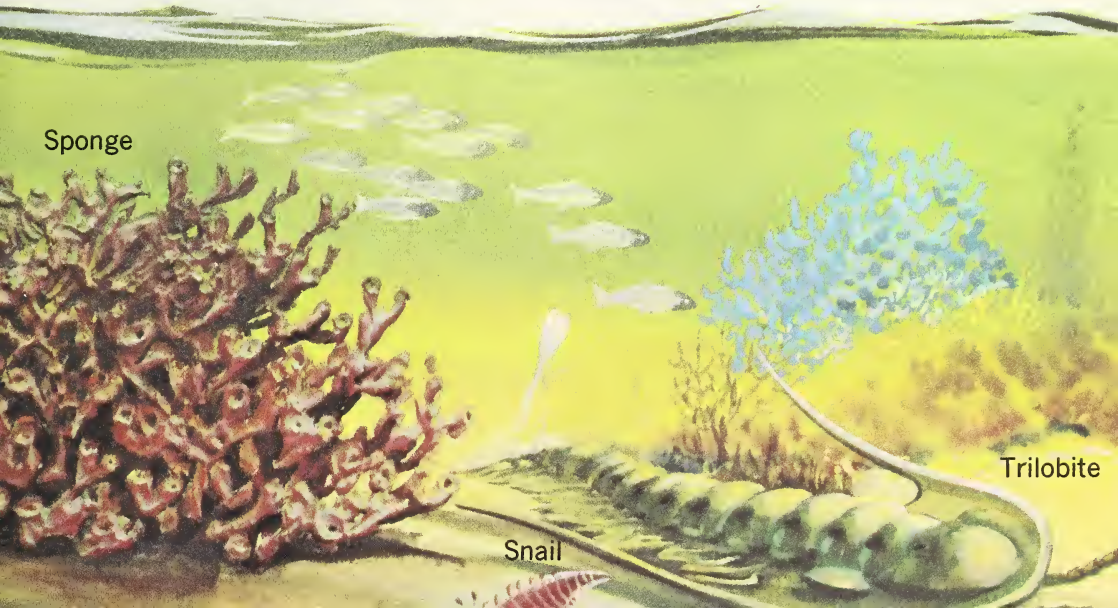
The next things to live on the earth were seaweeds, snails, and small sea animals called **trilobites** (TRY-luh-byts).

Scientists believe that the next animals to appear were fishes.

After the fishes, the first land animals came into being. These were **scorpions** (SKOR-pee-unz) and **spiders.**

Spider

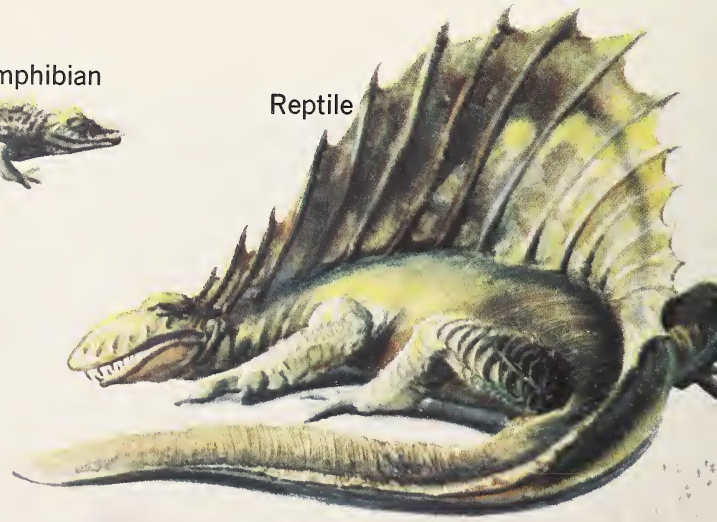
Scorpion



Then came the first land plants and the first insects and **amphibians** (am-FIB-ee-unz). An amphibian is an animal that lives part of its life in water and part of its life on land. Most amphibians lay their eggs in water. Can you name any amphibians?

There are many amphibians still living today. A frog is an amphibian.

The next animals were the **reptiles** (REP-tilz). Reptiles have **scales** on their bodies. Scales are like small flat pieces of skin. Most reptiles slide along the ground



Land plant

or walk on four short legs. Most reptiles lay eggs that have shells around them.

There are many reptiles living today. A snake is a reptile. So is a turtle. Can you think of any others?

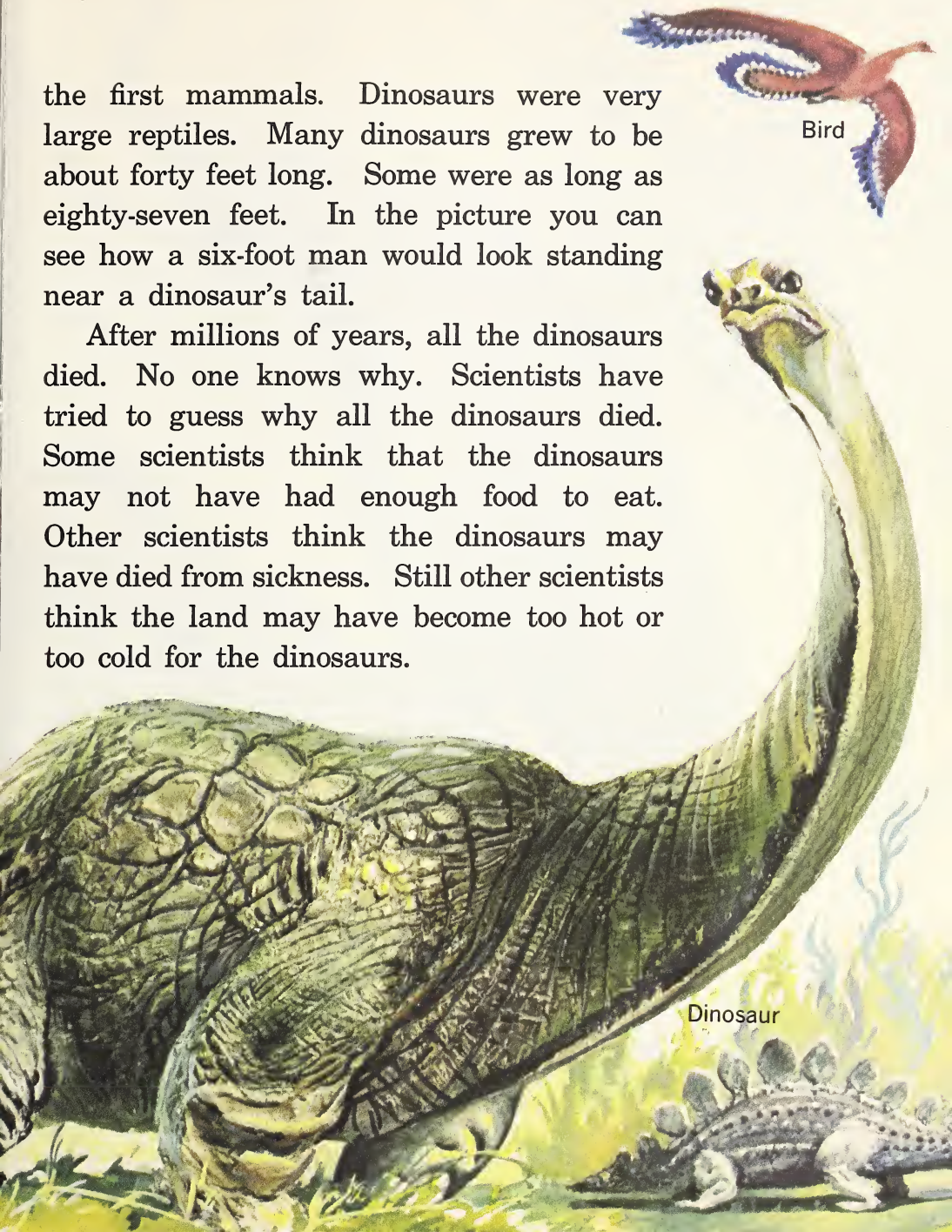
Many millions of years after the first reptiles, the first **mammals** (MAM-ulz) started living on the earth. Mammals have hair on their bodies. Mammal mothers have babies that are born live from the mothers' bodies. After they are born, the mammal babies get milk from their mothers' bodies.

Here are some of the many mammals that are living today. Can you name the mammals in this picture?

The first **dinosaurs** (DY-nuh-sorz) and the first birds started living on earth after

the first mammals. Dinosaurs were very large reptiles. Many dinosaurs grew to be about forty feet long. Some were as long as eighty-seven feet. In the picture you can see how a six-foot man would look standing near a dinosaur's tail.

After millions of years, all the dinosaurs died. No one knows why. Scientists have tried to guess why all the dinosaurs died. Some scientists think that the dinosaurs may not have had enough food to eat. Other scientists think the dinosaurs may have died from sickness. Still other scientists think the land may have become too hot or too cold for the dinosaurs.

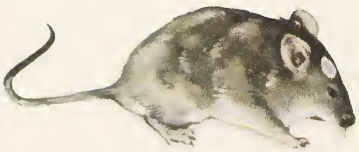


Animals such as the horse, the monkey, and the elephant all started living after the time of the dinosaurs. Plants with flowers, such as grasses, also started living after the dinosaurs had all died.

Just when man started living on earth is not known. Scientists have found bones like those above that look as though they are those of man. Although very few of these bones have been found, scientists believe that man probably started living on the earth about a million years ago. When man first appeared, the earth was already very old. By studying the skeleton parts of early man, scientists have found that early man's hands were able to hold tools.

Above you see some of the tools found by scientists near the bones of early man. What do you think scientists can tell about the activities of early man from these tools? What kinds of tools do you think these are? What do you think they are made from? What do you think can be made from them?

On the next three pages you can see how man differs from other living things in two



important ways. The brain of man is different from the brains of other living things. Man can learn both better and faster.

Look at the pictures below. What can you tell about the sizes of the brains shown compared with the sizes of the living things?

On the next page, you see the other important way in which man differs from other living things.

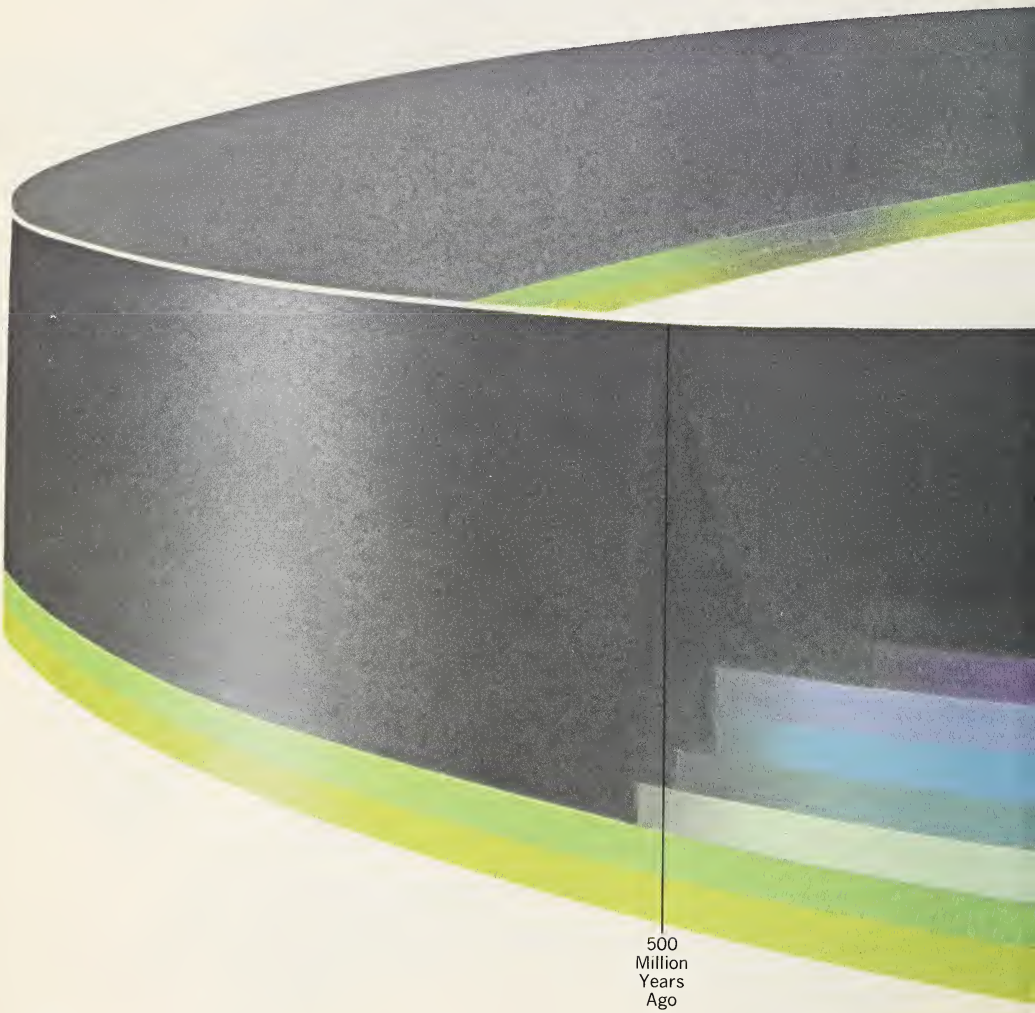
Look at the pictures below. Notice that early man was able to touch all his fingers with his thumb. Look at your hands. Can you touch your fingers in the same ways as shown below?

On the next page you see a picture of early man. Tools that have been found with his bones show that he used spears to hunt animals. You can see that his hand is able to hold tools. With the help of tools he could raise plants to provide him with food and could protect himself from animals.

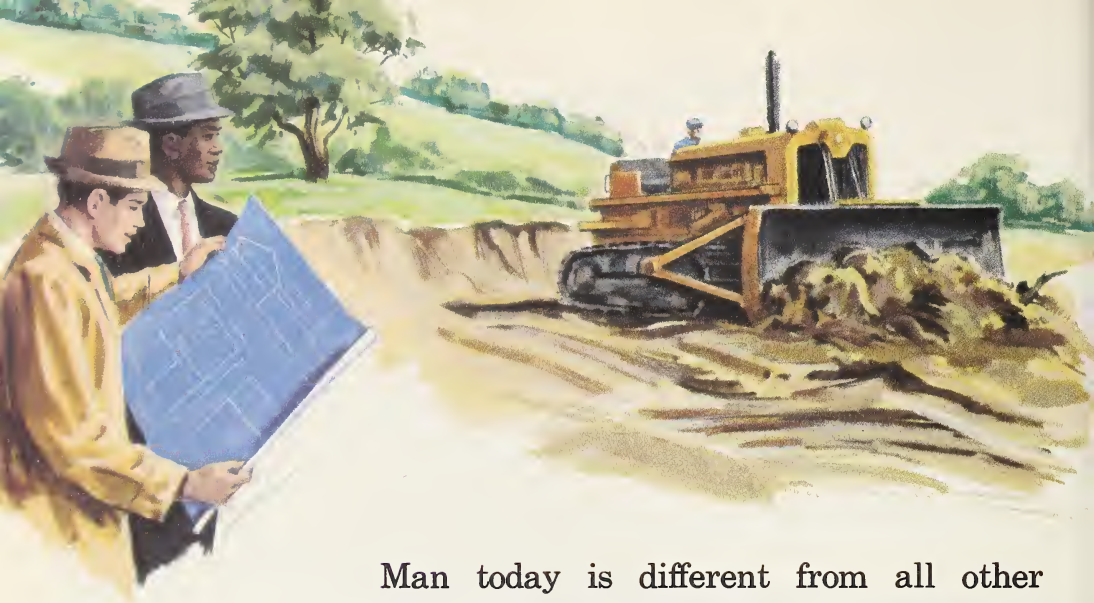
The **Neanderthals** (nih-AN-der-thalz) were a race of early men who lived thousands of years ago in Europe. They lived in caves. When people today talk about cave men, they usually mean the Neanderthals.

Today's scientists know much about the way the Neanderthals lived. In the caves of the Neanderthals, scientists have found many things that the Neanderthals used.

The living things of today are different from early living things. It has taken billions of years for living things to come to be as they are today.



Man
Monkey
Tiger
Elephant
Horse
Bird
Dinosaur
No longer living
Reptile
Land plant
Spider
Fish
Trilobite
No longer living
Snail
Jellyfish
Algae
Today

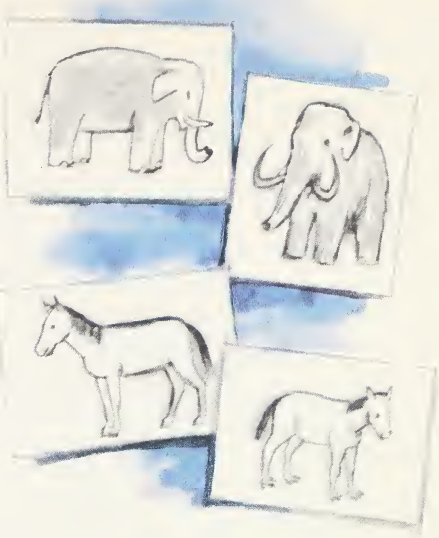


Man today is different from all other living things. Man can change his **environment** (en-VY-run-ment) in many more ways than they can. An environment is the place where a living thing lives.

Man changes his environment in many ways. Man can make clothes for himself. He can grow food. Because he can reason, talk, and write, he can change the world around him.

This book has taught you some of the things that scientists have learned until now. Someday *you* may discover something new. Then your discovery will be written down for the people who will live after you.

USING THE SCIENTIST'S WAY



If you live near a museum, plan a trip there. There are museums in nearly all big cities. Visit the rooms that show what early animals looked like.

If you cannot go to a museum, visit a library. You can use books in the library to find out more about early animals. After your visit, draw pictures of the early animals. Show how they were different from the animals of today.

Louis Agassiz

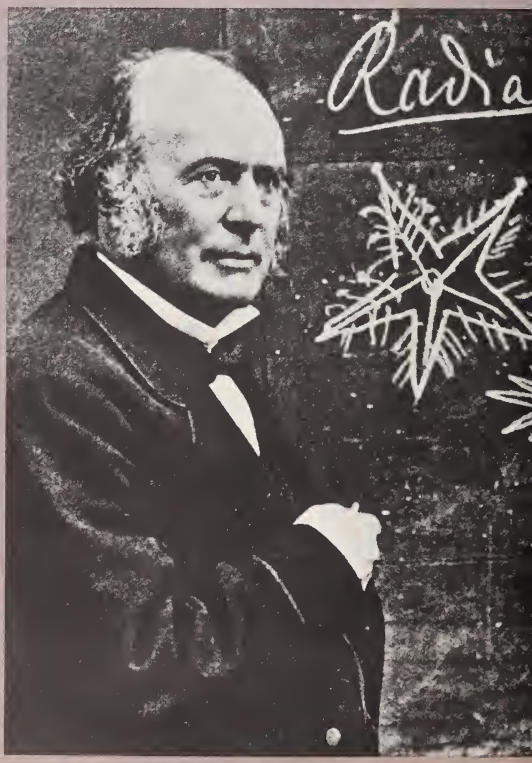
(1807–1873) SWITZERLAND

Louis Agassiz (AG-uh-see) was a pathfinder in two fields—nature study and earth science.

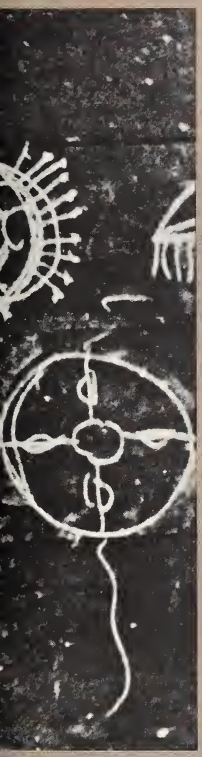
As a young boy, he kept rabbits, guinea pigs, snakes, and wild birds in cages under trees in his backyard. He caught fish with his hands and brought them to the pool behind his house. There he watched for hours as the fish moved about. He studied their shapes and colors and the bones in their fins.

In 1828, Louis became a doctor of medicine. But instead of working as a doctor, he studied animals and earth science. He was interested in living animals and in the fossils of animals. The fossils were so different from the living animals that he thought there must have been great changes on the earth to have made such changes in animal life. He looked for signs that might show changes.

While still a young man, Agassiz took trips through the Swiss mountains. He went with a friend whose hobby was nature study. They saw ridges heaped



with rocks, stones, and pebbles. They saw huge boulders standing in fields. These things showed that there had been changes on the earth. Other scientists in Agassiz' time thought that flooding waters had made the changes.



But Agassiz did not think that flooding waters explained what he saw. He did not think that water could have piled up such materials. He thought that only moving, melting ice could have left these materials. Only a sea of ice could have carried such great boulders so many miles from their source.

In 1837, Agassiz told a group of scientists that there had been a "great ice age" during which most of northern Europe and the British Isles were covered with a sea of ice. Not many people believed him.

When Louis Agassiz died, his idea of the ice age had still not been accepted as fact. It was not until the 1900's, when many other scientists had gathered more facts, that Louis Agassiz' idea of a great ice age was accepted.

Using What You Have Learned

1. Your class can make a picture story about living things. You can show which plants and animals were the first to live on the earth. Start with the algae. Then draw pictures of some other plants and animals that lived after the first algae. Write about each of the living things that you show. Tell how big they grew. Tell where they lived. Tell which are living today.

2. If you live near a pond or a river, you may be able to get some algae. The algae often grow near the top of the water. Fill a jar with some of the water and algae. Bring the jar to your class.

Try to make up some good questions about algae. Then use the library to find the answers to your questions. You might ask such questions as: Why are the algae green? Which animals eat algae? What would happen if there were no algae in the seas and rivers?

3. Scientists have found bones of horses that lived millions of years ago. From these bones, the scientists can tell what the horses looked like. You can find out more about these early horses by going to the library and reading about horses in an encyclopedia.

WHAT YOU KNOW ABOUT

Our Planet Earth

What You Have Learned

The earth has a **crust,** a **mantle,** an **outer core,** and an **inner core.** Among the first living things on the earth were **algae.** Then came sea animals such as **sponges** and worms; then came seaweeds, snails, and **trilobites;** then came fishes.

Among the first land animals were **scorpions** and **spiders.** Next came land plants, insects, and **amphibians,** followed by **reptiles, mammals,** and birds.

Man started to live on the earth about one million years ago. Man's brain looked different from the brains of other living things. His brain was larger than the brains of other living things of the same size. Man also could touch his fingers with his thumbs. The bones of one early man, the **Neanderthal** man, were found in Europe. The Neanderthal men were a race of men who lived in caves, thousands of years ago.

Because man can think and write, man has learned to change much of his environment. Unlike other living things, man can change his environment in many different ways.

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

algae	environment	matter	scorpion
amphibian	inner core	Neanderthal	spider
brain	liquid	outer core	sponge
crust	mammal	reptile	trilobite
dinosaur	mantle	scales	

Which Came First?

Number a page in your notebook from 1 to 6. Then look at the names of the pairs of animals below. For each pair, tell which living thing came first. Write the name of that living thing next to the number on your paper.

1.	goldfish jellyfish	**3.**	seaweed algae	**5.**	frog monkey
2.	turtle scorpion	**4.**	sponge dinosaur	**6.**	bird spider

YOU CAN LEARN MORE ABOUT

Our Planet Earth

Guess the Word

1. A dinosaur was one.

2. The part of the earth that has the seas and land on it.

3. It lives part of its life in water and part of its life on land.

4. The hard rock part of the earth under the crust.

5. Small green sea plants that were among the first living things.

TILEREP

STURC

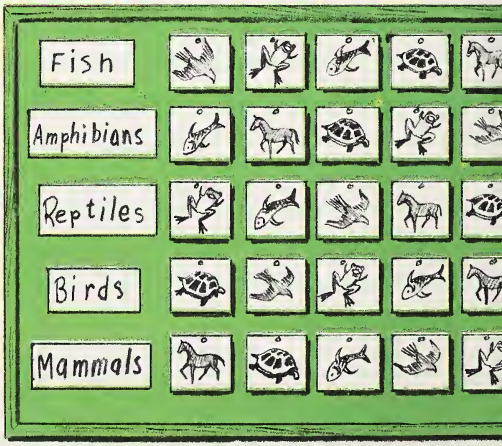
PHIAMANBI

LETNAM

GALEA

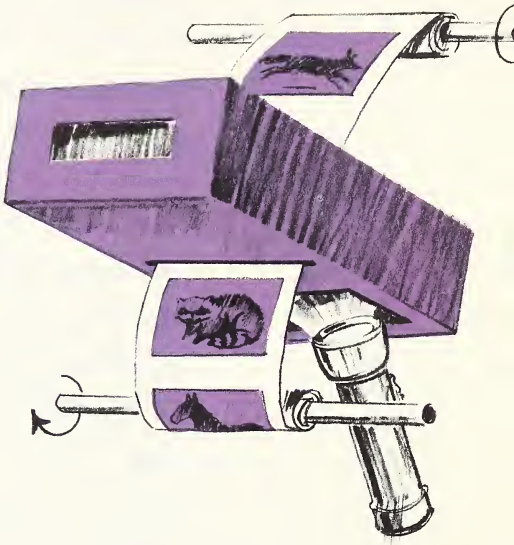
Bulletin Board

Make signs that say *Fish*, *Amphibians*, *Reptiles*, *Birds*, and *Mammals*. Hang the *Fish* sign on a bulletin board. Next to it, hang a picture of an animal from each of the animal groups. Do the same thing with the other signs. Let people try to find the right picture for each kind of animal. See how many pictures they can guess right.



Make a Roller Movie

Some boys and girls in your class can draw pictures and write sentences to show how the earth has changed. Paste the pictures and sentences on a long piece of paper. Paste one end of the paper to a stick. Pull the paper through slits in a box. Paste the other end to another stick. Shine a flashlight through a hole in the box. Then turn the stick and see the movie.



You Can Read

1. *A Book to Begin on Dinosaurs* by Eunice Holsaert and Robert Gartland. Learn how dinosaurs lived.

2. *Your Changing Earth* by Hy Ruchlis. See how the earth changed.

3. *Up from the Sea Came an Island* by Hazel Allen. Read how living things came to an island.

Do You Remember?

Being curious helps you learn more about yourself and the world. When you are curious, you ask questions and try to find answers.

Good *sources* help you find answers to your questions. Scientists use good sources to find answers. Scientists do *experiments* to find answers. When a scientist is the first to find an answer to a question, the answer is called a *discovery*.

Scientists have made many discoveries about the *universe*. *Telescopes* have helped them to discover that the earth is one of nine *planets* that *orbit* the sun. The sun is a star. Scientists call the sun and the nine planets that orbit it the *solar system*.

Scientists have discovered that the solar system is only a small part of the *Milky Way Galaxy*. The Milky Way Galaxy, with its many stars, is only one of millions of galaxies in the universe.

Scientists learned that the earth turns around on its *axis* as it orbits the sun. The moon orbits the earth, and *reflects* sunlight.

Our planet earth has an *inner core,* an *outer core,* a *mantle,* and a *crust.*

Everything on earth is *matter.* Some matter is living. There are many living things on the earth. The living things on the earth have changed through the ages. Scientists today believe *algae* were among the first things to live on the planet earth. After the algae, sea animals such as *sponges, trilobites,* and fishes started living. Then came land animals such as *spiders* and *scorpions.* Next came the first land plants, insects, *amphibians, reptiles,* and *mammals.* After that came the *dinosaurs* and other animals.

After almost all other living things, man appeared on the earth. Man's brain differed from those of other living things. Man could learn faster and better. Early man also could touch all his fingers with his thumbs. Man today can easily touch all his fingers with his thumb. Because man can reason, talk, and write, he can change his *environment* in many different ways.

4

How Animals Live

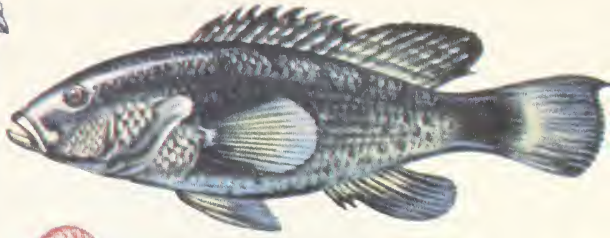
What You Will Find Out

Animals live in many different kinds of places. Some live in very cold places; others live in very warm places. You will find out how animals can live in such different places.

Animals are different from things which are not alive. Animals are also different from plants. Do you know how to tell when a thing is an animal? You will find out how to do this.

What Is an Animal?

Here are some pictures of living things. Look at them. Would you say that all of the living things pictured are animals?



Above are some more pictures of living things. Which of them are animals? Scientists say that *all* the living things in these pictures are animals.

Living things are plants or animals. Sometimes it is hard to tell whether a thing is a plant or an animal. Can you tell which of these living things are plants and which are animals?

Scientists have ways to tell whether something is a plant or an animal. Here are some of the ways.

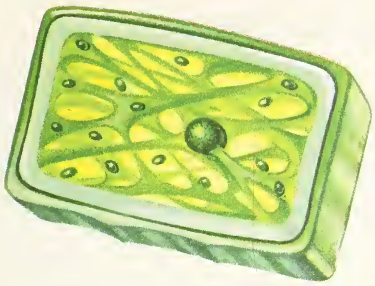
Green plants can make their own food. But animals cannot make food. An animal must get its food by eating green plants. Animals can also get food if they eat other animals that have eaten green plants. Why do you think this is so?

Most plants do not move about. But most animals do move about. Animals move about to get their food.

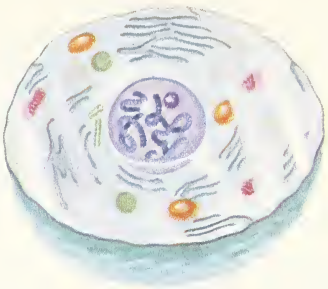
Most plants can grow new parts, such as leaves and branches and roots. But most animals cannot grow new parts, such as feet, eyes, and legs.

There is another way in which plants and animals are different. All plants and animals are made up of very small live bits called **cells.** But plant cells are not quite the same as animal cells.

Look at the picture of an animal cell and a plant cell. Can you tell how these cells are different? Can you tell how these cells are the same?



Plant cell



Animal cell

Do you see the thicker covering around the plant cell? This covering is called a **cell wall.** The covering around an animal cell is not as thick. The covering around an animal cell is called a **cell membrane** (MEM-brayn).

Cells can change. Some cells can grow larger. Some can change their shape. Sometimes, cells make new cells.

USING THE SCIENTIST'S WAY

Look at the list below. List all the plants in one group and all the animals in another.

rose	*dog*	*ant*	*cactus*	*bluejay*
cow	*fern*	*peony*	*elephant*	*petunia*
elm	*jaguar*	*lily*	*cat*	*juniper*

How Are Animals the Same?

Here are some pictures of living things. Which of these living things are animals? Would you say that all are the same?

You might not think so, but in some ways all these animals are like each other. In some ways, every animal is the same as all others. Robins, ants, whales, monkeys—all animals are the same in some ways.

All animals must eat. Cows and dogs and frogs must eat. Bees and hens must eat. You must eat too. Every animal must eat to stay alive. The food you eat helps keep you alive and well. It helps your body do its work.

All animals must have air. A pig must have air. A bear must have air. A crow and a fish must have air, too. People also must have air. Every animal must have air to stay alive. **Oxygen** (OK-sih-jun) is a gas that is part of the air. The cells of all animals need oxygen to be able to use the food that the animals eat. You will learn how the cells get oxygen.

All animals must get rid of wastes. The wastes are the various things that the animal's body cannot use. One way you get rid of wastes is by going to the toilet. You also get rid of some wastes each time you breathe out some air. Every animal must get rid of wastes to stay alive. Every animal must get rid of wastes to stay healthy. If animals did not get rid of wastes, then the wastes would poison their bodies.

All animals can have babies. A deer can have babies. A clam can have babies. So can a horse have babies. People can have babies. What would happen if animals could no longer have any babies?

USING THE SCIENTIST'S WAY

Do all animals have teeth to chew the food that they eat? Think about a dog and a robin. Do both animals have teeth? Draw a picture of a dog and a robin. Show which animal has teeth. Can you tell what kind of food each animal eats?

Where Do Animals Live?

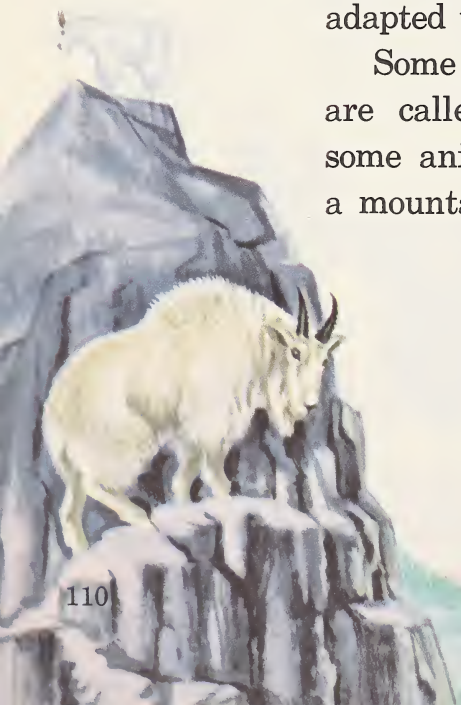
Animals live in many different kinds of environments. An environment can be a hot place or a cold place. It can be a wet place or a dry place.

Animals must be **adapted** (uh-DAP-ted) to their environments. This means that they are fit to stay alive in their environments.

Some parts of the earth are very dry. There is hardly enough water for any plant or animal life. Such a place is called a desert. Can you think of any animals that are adapted to living in a desert environment?

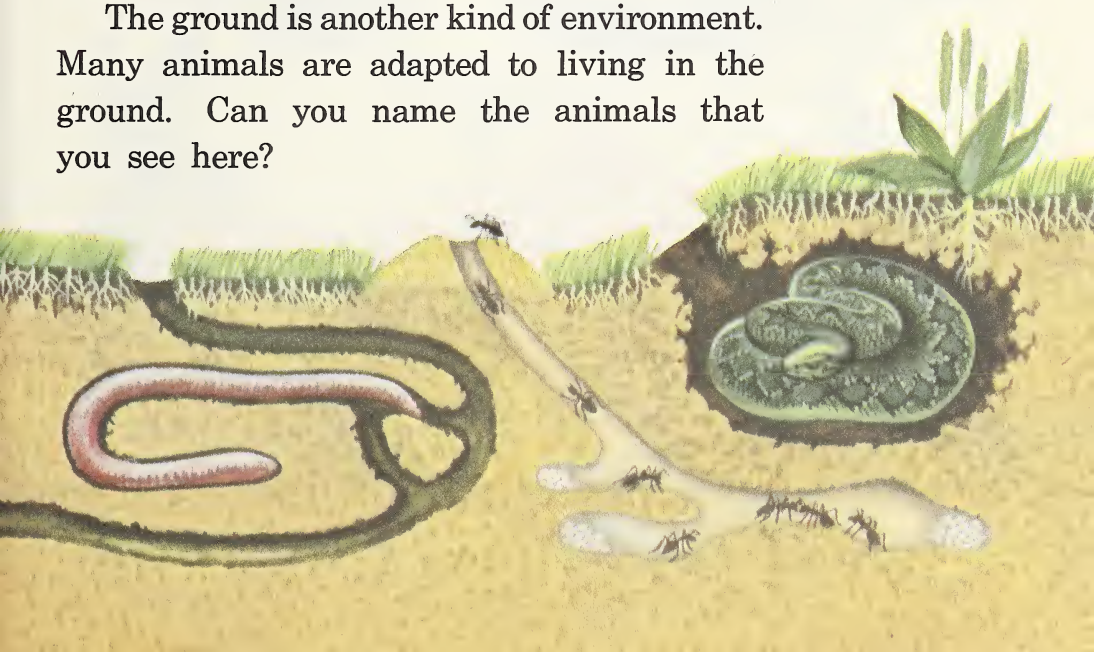
There are some places on the earth where many trees grow. Such places are called forests. What are some animals that are adapted to living in a forest environment?

Some parts of the earth that are very high are called mountains. Can you think of some animals that are adapted to living in a mountain environment?



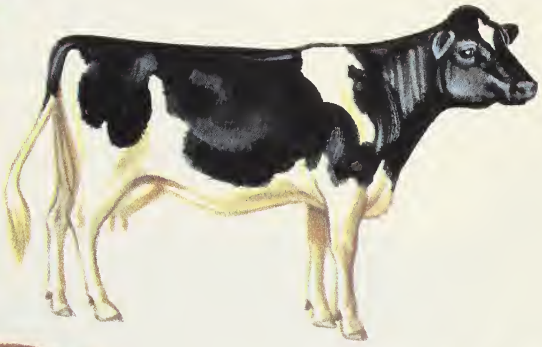
Still another environment is a watery one. The sea is a watery environment. What are some animals that are adapted to living in a sea environment?

The ground is another kind of environment. Many animals are adapted to living in the ground. Can you name the animals that you see here?



Some animals are **cold-blooded.** The body temperatures of cold-blooded animals change as the temperatures of their environments change. A fish is a cold-blooded animal. A frog is a cold-blooded animal. So is a turtle. Their body temperatures change when the temperature of the water in which they live changes.

Some animals are **warm-blooded.** The body temperatures of warm-blooded animals always stay about the same. You are warm-blooded. All people are warm-blooded. What do you do as the air temperature changes? What do you do when it gets very warm? What do you do when the temperature is very low?



USING THE SCIENTIST'S WAY

Ants are "social" insects. That means they do not live by themselves. Ants live together in large colonies. They are adapted to that kind of life.

Can an ant adapt to living alone? Collect some ants. Put each one in its own jar. Be sure that each ant gets food, water, and air. What happens?

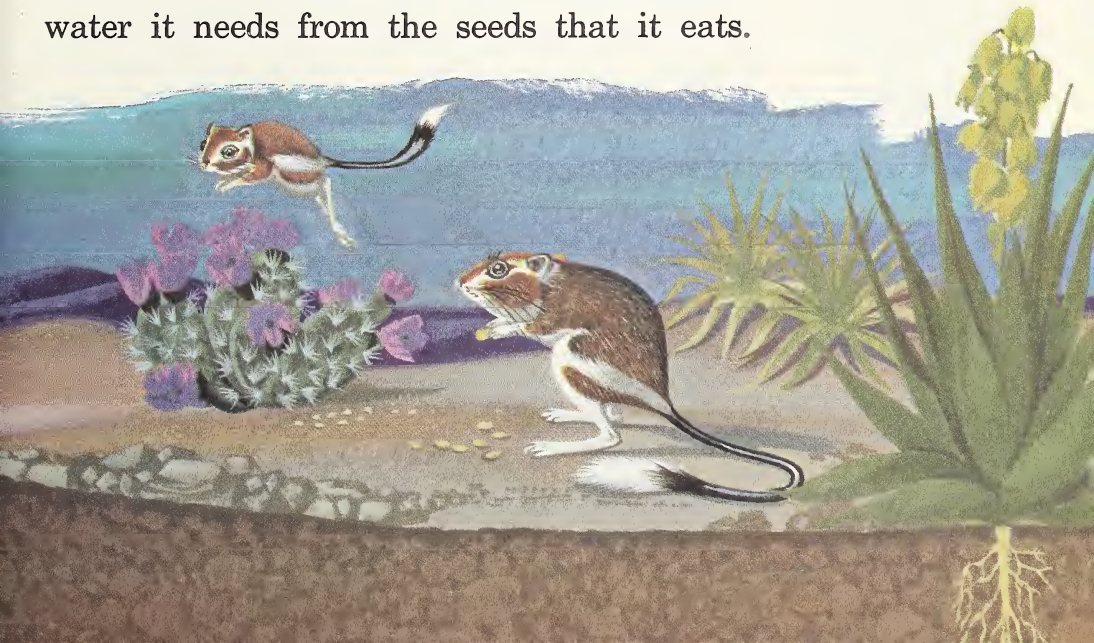
How Can Animals Live in a Desert?

Here is a picture of a kangaroo rat. The kangaroo rat is an animal that is adapted to living in a desert environment.

The desert gets very hot in the daytime. But when the hot sun shines on the desert, the kangaroo rat keeps cool. It keeps cool by staying under the ground. It stays about two feet under the ground in a tunnel.

The kangaroo rat is a **nocturnal** (nok-TER-nul) animal. A nocturnal animal is active at night. The kangaroo rat comes out each night to hunt for its food. It hunts for seeds.

There is not much water in the desert. That is because there is very little rain in the desert. But the kangaroo rat does not need much water to live. The kangaroo rat is adapted to a dry environment. It gets the water it needs from the seeds that it eats.



The kangaroo rat can live well in a desert environment where the days are hot and dry. Look at the picture. How do you think the kangaroo rat uses its sharp claws?

USING THE SCIENTIST'S WAY

You can learn more about the desert. Make up some questions about the desert. You might want to ask questions such as "What kinds of plants are there on a desert?" and "How are they adapted?" Then try to find the answers to your questions. What good sources can you use?

How can you find out about animals, other than the kangaroo rat, that live in the desert? Try to find out how such animals are adapted to living in a place where the days are hot and dry.

How Can Animals Live in a Forest?

The forest is an environment where there are many trees. Many nuts fall to the ground from the trees.

A squirrel is an animal that is adapted to living in a forest. A squirrel eats nuts. A squirrel can find the nuts near the trees in the forest.

A squirrel has very sharp claws. It uses its sharp claws to dig holes in the ground. The squirrel puts the nuts into the holes and then fills up the holes.

The sharp claws also help the squirrel to climb trees to get away from other animals.

There are many kinds of squirrels. Some squirrels make their nests in the branches of the trees. Some make their nests in holes in the trees.

USING THE SCIENTIST'S WAY

Here are pictures of four kinds of squirrels. Each of these squirrels lives in a different part of the United States. Tell which squirrel lives in your part of the country. Use the library to find out how that kind of squirrel is different from other kinds of squirrels.

How Can Animals Live on High Mountains?

Mountains are often very rocky. There are only a few plants that can grow among the rocks near the tops of high mountains.

Grasses and **mosses** are often the only plants that can grow near the tops of very high mountains. Mosses are small green plants that grow well in rocky places. You may have seen mosses growing in sidewalk cracks or on bricks or stones.

You might think that it would be hard for most animals to live near the tops of very high mountains. You would be right if you thought so. Most animals cannot live well where it is so hard to get food.

But one animal that can live well near the tops of high mountains is the mountain goat. The mountain goat is adapted to living in a mountain environment.

The mountain goat can walk very well where it is rocky. It has padding under its hoofs, which helps to make it sure-footed. It can climb where almost no other animals can go.

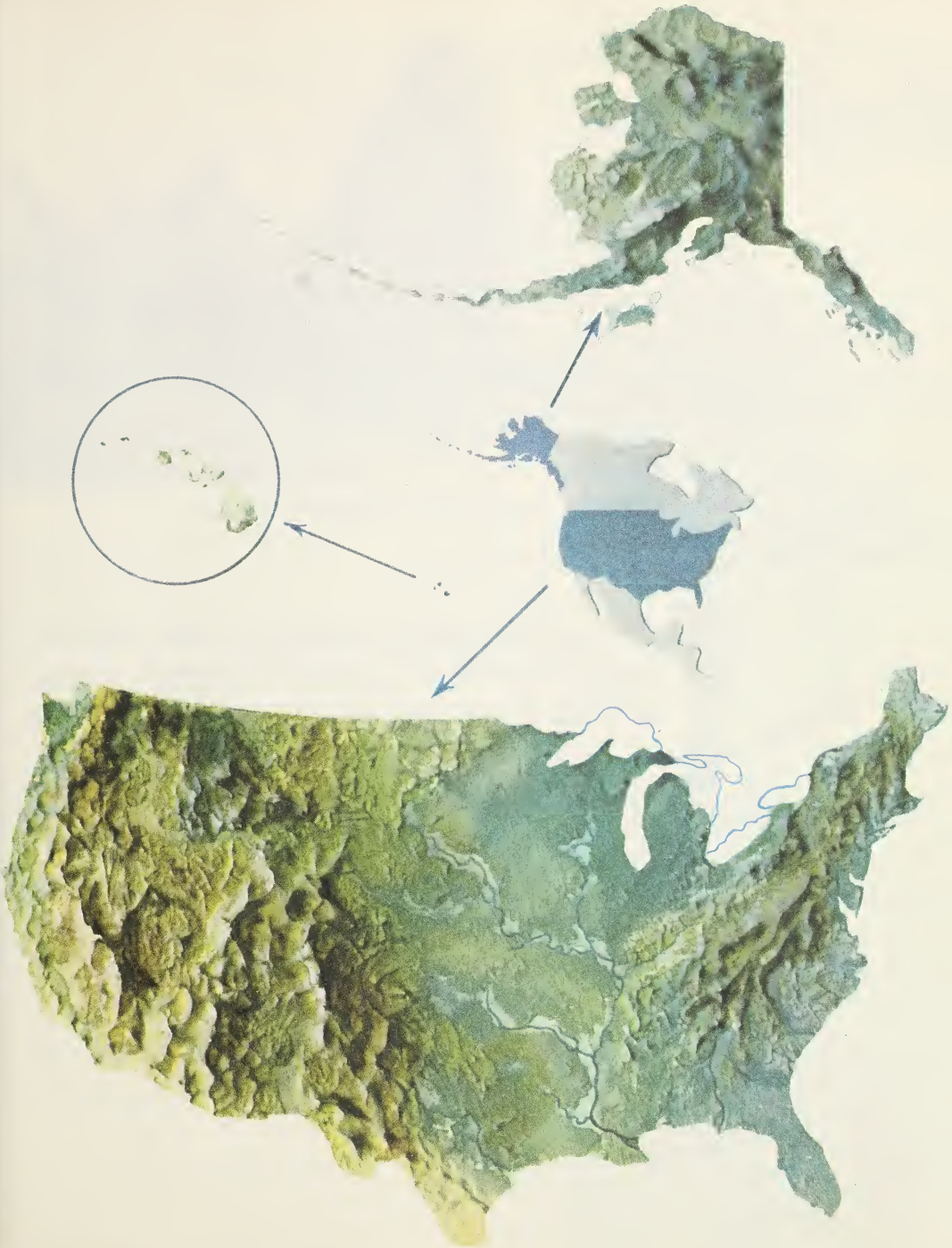
The mountain goat eats the grasses and mosses that grow near the tops of the high mountains.

It is often very cold on the tops of high mountains. But the mountain goat has fur that helps to keep it warm on cold days.

A mountain goat can live very well in a mountain environment.

USING THE SCIENTIST'S WAY

Look at the picture on the next page, which shows a map of the United States. Find your state on the map. Find the mountains that are nearest to your home. Which animals live in those mountains? How can you find out? What good sources can you use? You might want to look in an encyclopedia in the library. Or you might want to write a letter to a museum of natural history.



How Can Animals Live in the Sea?

The sea lion is an animal that can live well in the sea. Look at the picture. How do you think the sea lion moves through the water?

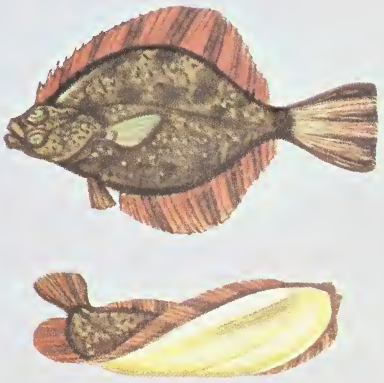
The sea lion's body is covered with fur. Under the fur is a thick layer of fat. How do you think the fur and fat help the sea lion keep warm in cold water?

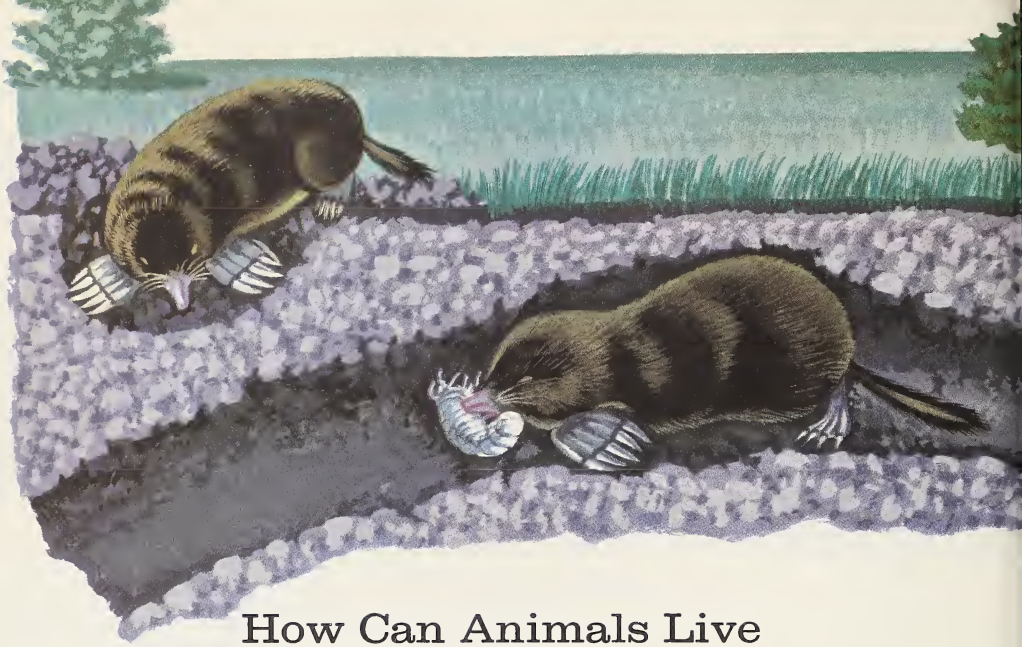
The sea lion eats smaller animals that it finds in the water. Here is a picture of some of those animals. Can you name them?

Some animals eat sea lions. But the sea lion is a good swimmer. It can often swim away from the animals that try to catch it and eat it.

USING THE SCIENTIST'S WAY

A flounder is an animal that lives in the water all the time. Try to find out more about this fish. What foods does a flounder eat? Does a flounder stay near the top or near the bottom of the water? What good sources can you use?



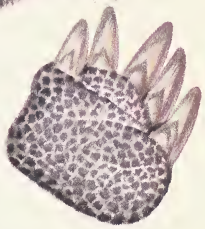


How Can Animals Live in the Ground?

A mole is an animal that is adapted to living in the ground. Here is a picture of the mole's home in the ground.

The mole stays in the ground most of the time. The mole digs tunnels in the ground. The mole's strong front legs and claws help it to dig the tunnels in the ground.

You might think there is not much to eat in the ground. But many bugs and worms live there. The mole eats many kinds of bugs and worms.



The mole has very small eyes and ears. But the mole can still find its way through the tunnels in the ground. The mole can find its way by using the hairs on its tail and its legs.

The mole can live very well in the environment of the ground.

USING THE SCIENTIST'S WAY

Your hair can help you to feel things. Close your eyes. Have a friend touch your hair very lightly. Be sure that your friend's hand touches only your hair and not your head. Can you feel when your friend's hand touches your hair?

ABOUT "A VISIT TO A ZOO AND AN AQUARIUM"

In the next few pages you will tour by way of pictures and words one of the world's great zoos, the New York Zoological Park (zoh-uh-LAHJ-ih-k'l), one of the institutions operated by the New York Zoological Society. This zoo has about 3,500 animals of more than 1,000 different kinds. This picture story will show some of the things that happen behind the scenes at the zoo.

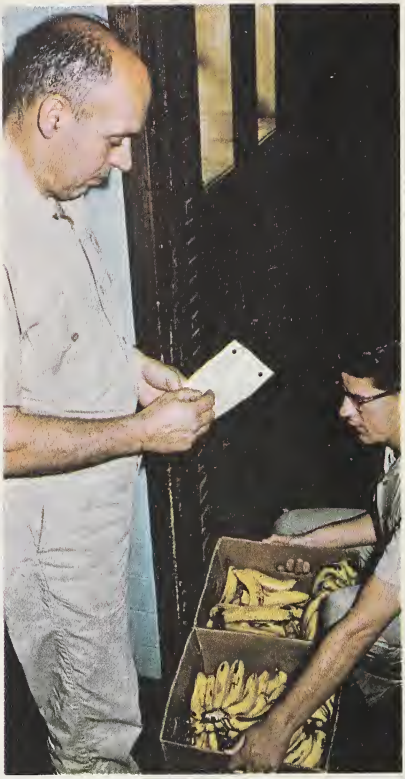
Animals are brought to the zoo from all parts of the world. They may be bought from wild animal dealers, collected by members of the zoo staff, or given as gifts to the zoo. Another way by which a zoo gets animals is when an animal is born at the zoo. This method is important, because many parts of the world are shut off from collectors. It is also cheaper to have an animal born at the zoo than to buy it or send an expedition to hunt for it. The animals come from many environments. The scientists and keepers at the zoo are trained to take good care of the animals.

There are three animal departments at the zoo—that of mammals, birds, and reptiles. A curator (kyoo-RAY-ter) is in charge of each. Each curator is a scientist who has studied for many years the kinds of animals placed in his charge.

Because of the care given these animals, they often live longer in the zoo than their own kind do living in the wild.

A Visit to a Zoo and an Aquarium

Our first stop is the Bird House. We are just in time to see the day's food supply arrive.

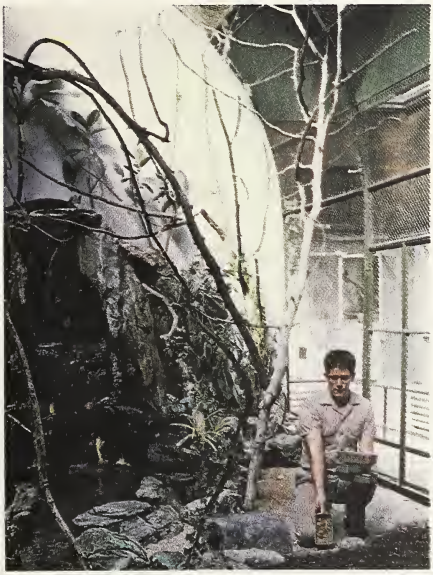


Feeding hundreds of birds is a big job. The keeper must mix the right amounts of foods. What foods do you see on the table?

A big grinder chops liver. When the grinding is finished the food is placed in a refrigerator until feeding time. Can you tell why?

Here are three different kinds of grains that will be fed to the birds.

The food trays are placed in each bird cage. As soon as the keeper leaves the trays and goes, the birds will swoop down from the trees for their breakfast.



Many exhibits in the Aquatic Bird House are not cages. They are open exhibits, with nothing between the birds and the people. Aquatic birds live in wet environments. In this house, the environments the birds live in are just like those they came from.

The Aquatic Bird House has birds from many environments. Name the two environments shown.

There are flamingos in shallow water. Here a keeper removes an empty food tray from the flamingos.

A flamingo builds a mud nest in which to place its eggs.

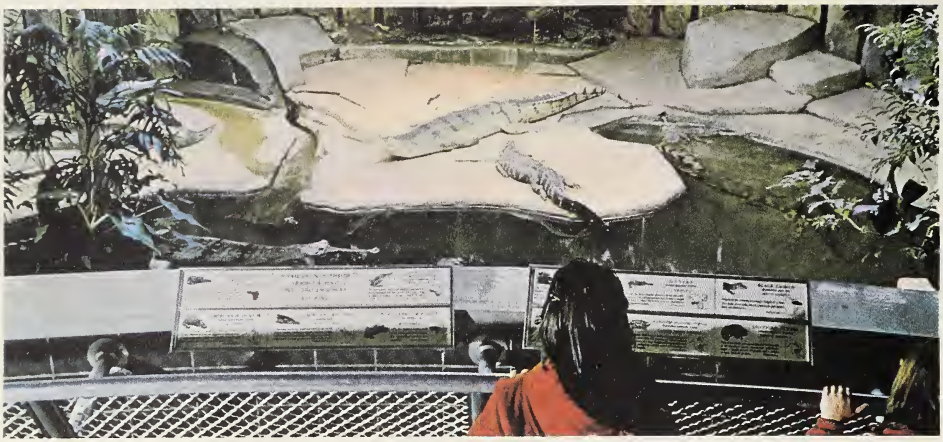
Fennec

There is a special exhibit in the Small Mammal House. It shows nocturnal (nok-TER-nul) animals—animals that move about and look for food at night—in a most unusual way. The light in this house is red. While it is daytime outside, night animals can be seen moving about instead of sleeping. To set up this exhibit, zoo scientists have used what they have learned about how animals see. Scientists have found that red light is the same as darkness to these animals. With red lights on, visitors to the zoo can see the animals. For the animals it is night, and so they move about. When the zoo is closed for the night, the keepers turn on bright white lights to shine on the animals so that they will sleep.

Nocturnal animals have larger eyes than most day animals of the same size. They can see in light that is too dim for our eyes. But they do not see things as sharply as we do. To find food and identify other animals, they have a keen sense of smell, sharp hearing, or both.

Galago

Black-shouldered opossum



Crocodiles are also nocturnal. The pupils of their eyes are slit-like, like cats' eyes. Can you tell why?

The keepers are always ready to answer questions children and grownups have about animals. Here the head keeper of the Reptile House shows a girl that the Eastern King snake he is holding is harmless.

There are other reptiles in the Reptile House, living, feeding, and moving about as they do in the wild. What animals do you see?

Besides its many buildings, the zoo has land on which animals roam as they would in the wild.

When it gets cold, elephants leave their large outdoor homes and go inside to their warm cages. Here you see two elephants taking food from the keeper. What do they eat?

The jaguar seems to be hungry for the fresh meat the keeper is getting ready to put in the cage.

When animals get sick they may be taken to the Animal Hospital.

Each animal brought to the zoo is examined at the zoo's Animal Hospital before it is put on exhibit. The hospital has a veterinarian (vet-er-uh-NAIR-ee-un) who watches over the health and diet of the animals. A veterinarian is a doctor who treats animals.

This silvered leaf monkey has been having trouble walking.

The monkey gets a medical checkup from the zoo's veterinarian.

The nurse holds the monkey while the veterinarian examines its ears, mouth, and heart.

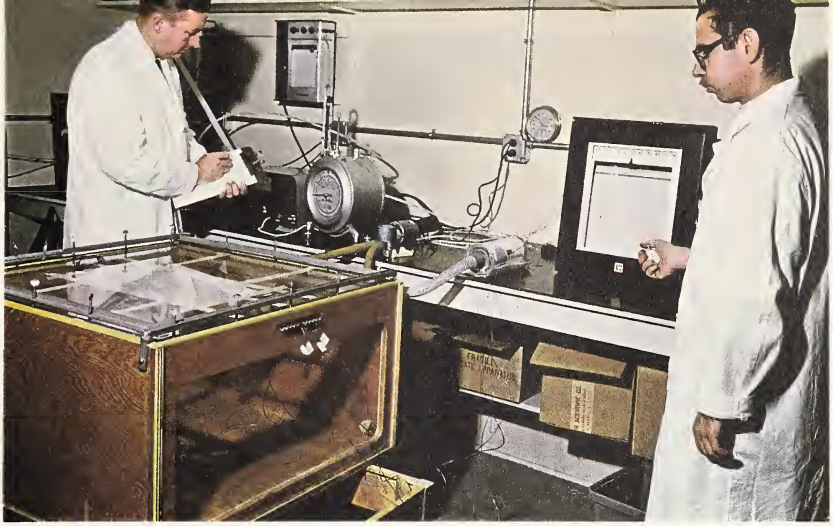
The veterinarian also studies an X-ray picture that has been taken to see if any bones are broken.

Sometimes the veterinarian must treat an animal in its cage.

A baby antelope that is ill gets a shot to make it well.

Sometimes a large animal such as the wild sheep called aoudad (AH-oo-dad) must be made quiet before the veterinarian can treat it. To do this the veterinarian uses a rifle or a pistol to shoot a drug into the animal that will quiet it.

In a few minutes, keepers will remove the animal from its outdoor cage and bring it to the hospital.



A zoo keeps and cares for animals and also has scientists who study animals. The curator of reptiles is such a scientist. With his assistant, you see him doing an experiment to find out how much oxygen an Indian Python uses in burning up its food. The snake is in the left corner of the box.

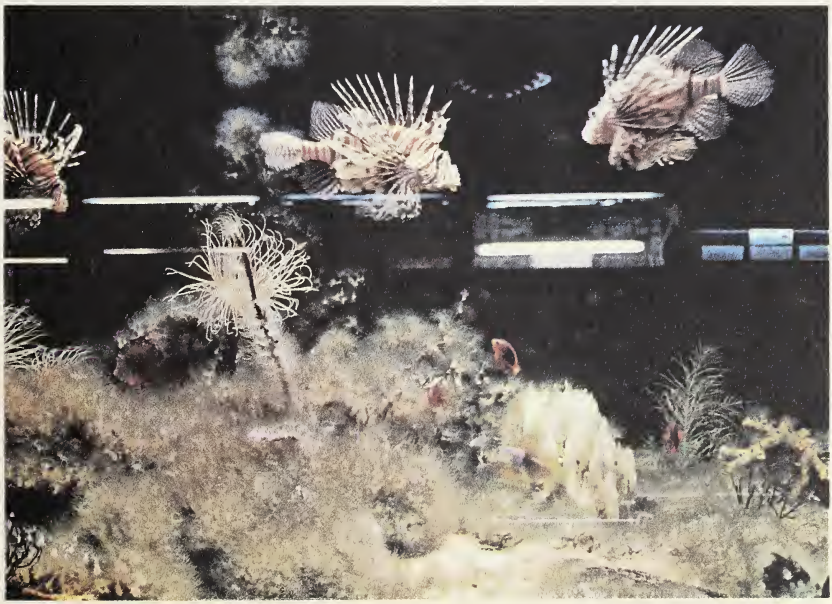
The curator uses a microscope to study the fang of a snake.

The zoo houses the National Collection of Heads and Horns, a museum of big-game animals.

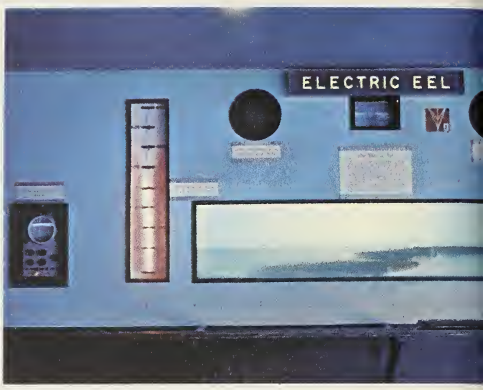
The New York Aquarium, also operated by the New York Zoological Society, but in another section of New York City, overlooks the sea. Here there are whales, walruses, seals, sharks, sea horses, electric eels, and other sea life.

Olaf, a walrus, eats his breakfast in his large outdoor pool.

Inside are many exhibits that show fish and other living things feeding and moving about as they do in their natural environments.



Every hour, the keeper uses a pole to touch the electric eel. Visitors can see the eel give off electricity that lights the signs and makes a crackling sound.



At the aquarium you can also see Dr. William Beebe's bathysphere. It must have taken much courage for Dr. Beebe to go deep into the water in this small, ball-shaped vessel to study sea life. You can read more about Dr. Beebe on pages 144-145.

Our tour is over. But there is still much more to see at the zoo and the aquarium. Why don't you plan to visit a zoo and an aquarium soon?

MORE ABOUT "A VISIT TO A ZOO AND AN AQUARIUM"

There are many exhibits at the zoo that do not have cages or bars. One such place is the African Plains. Here African animals such as lions, antelopes, and ostriches roam. Nearby are other big, open fields where yak, bison, llamas, guanacos, and vicunas roam. There is a moat to keep apart some of the animals and to protect zoo visitors. The moat is a deep open ditch. The homes many of the animals live in are very much like their homes in the wild. For example, in the Aquatic Bird House, there are shore birds living on a real shore, marsh birds in a real marsh, and swamp birds in a real swamp. There are no bars or even windows on these exhibits.

The New York Aquarium, which is also in New York City, overlooks the sea. In the aquarium many different kinds of water life can be seen in settings like those found in nature.

Much scientific research goes on at the zoo and at the aquarium. Scientists from the zoo and aquarium also take part in research going on in other parts of the world. Some of the scientists are studying butterflies and fish-eating bats in Trinidad, fiddler crabs in Malaya, and seals in Antarctica. Others are working on problems such as how to get new drugs from the sea.

Zoos and aquariums are lively, exciting places to visit. Is there a zoo or aquarium near you? If so, plan to visit it soon.

William Beebe

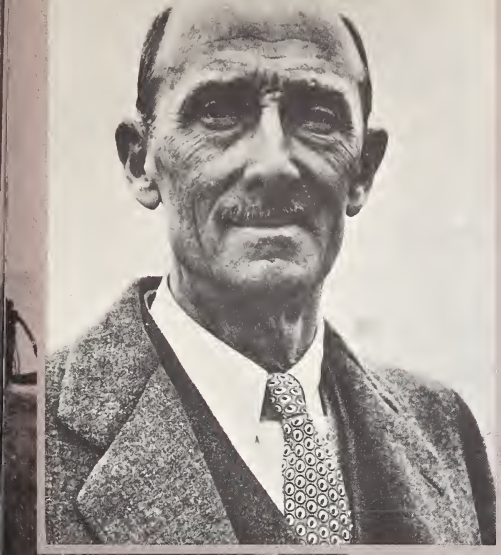
(1877–1962) UNITED STATES

Men have studied land animals for thousands of years. But only in the last thirty years have scientists been able to peer into the depths of the waters to study life in the oceans.

William Beebe (BEE-bee) was a scientist who studied living things. He knew that deep in the waters of the oceans there was an unseen world of living things.

How could he reach down into the waters to this world? Divers wearing diving suits and helmets could plunge only 525 feet into the ocean. Beebe wanted to go down more than a thousand feet. To go down this far was a problem. The pressure of water so far below the surface crushes a man.

To solve this problem, Beebe built a large hollow metal ball that was called a **bathysphere** (BATH-ih-sfeer). It could hold

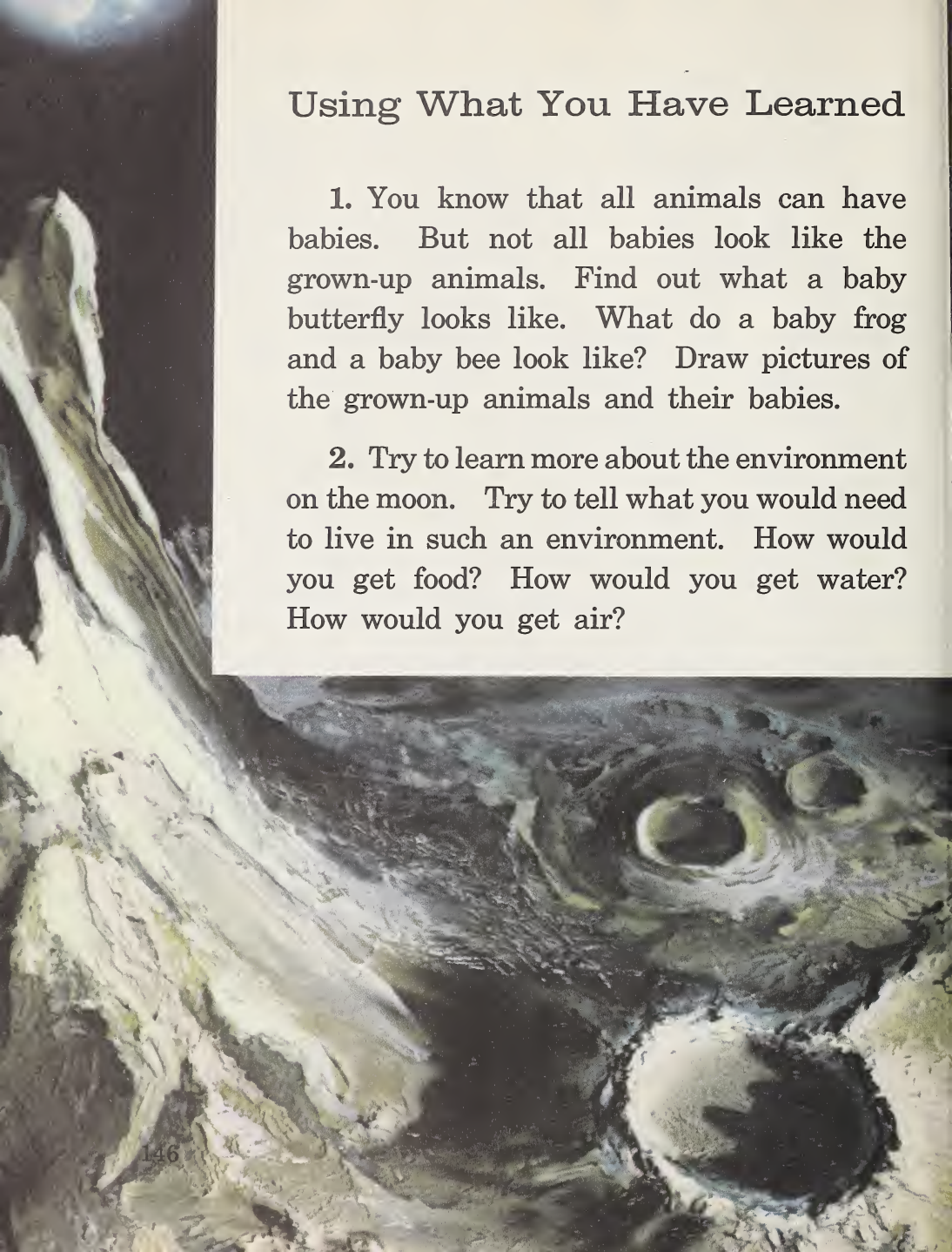


two people. Air was pumped into the bathysphere through a cable from a ship on the surface of the water.

The men in the bathysphere could talk to the men aboard the ship through a telephone line. Beebe had to tell the men aboard the ship what he saw because it was too dark for him to take notes. The farther down the bathysphere went, the darker it became. Half a mile down, there was total darkness.

Beebe saw animal life never before seen by man. He was the first to see and report on many animals. He saw fish that glowed. He saw animals with strange and startling colors. He saw fish with eyes that looked like telescopes, and fish with flat bodies, and others with long, pointed tails.

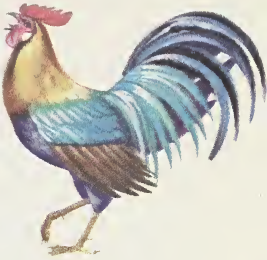
William Beebe's discoveries of sea life were as exciting as the discoveries of the first astronauts to travel in outer space.



Using What You Have Learned

1. You know that all animals can have babies. But not all babies look like the grown-up animals. Find out what a baby butterfly looks like. What do a baby frog and a baby bee look like? Draw pictures of the grown-up animals and their babies.

2. Try to learn more about the environment on the moon. Try to tell what you would need to live in such an environment. How would you get food? How would you get water? How would you get air?



3. Here are three different animals. Try to find out how each animal gets air. What good sources can you use to find out?

4. You can learn more about animals by keeping a pet. Your class might want to keep a hamster. Before you get a hamster, you should find out what a hamster needs to stay alive. What food must it have? What kind of cage does it need? Should its cage be warm or cool? What other things does a hamster need?

WHAT YOU KNOW ABOUT

How Animals Live

What You Have Learned

An animal is any living thing that is not a plant. Animals cannot make their own food. They must eat green plants or other animals that have eaten green plants. All animals are made of **cells.** Each cell has a covering around it called a **cell membrane.** Most animals move about to get their food. Most animals cannot grow new parts. All animals must eat, must have **oxygen,** and must get rid of wastes.

Animals that are **adapted** to their environments are able to stay alive in the places in which they live. There are many kinds of environments. Some are hot, some are cold, some are wet, and some are dry.

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

adapt	cell wall	nocturnal
cell	cold-blooded	oxygen
cell membrane	mosses	warm-blooded

Yes or No?

Number a page in your notebook from 1 to 6. For each sentence that seems true, write *Yes* on your paper. For each sentence that does not seem true, write *No*.

1. All animals must eat.
2. All animals make their own food.
3. All animals must get rid of wastes.
4. All animals can grow new parts.
5. All animals live in the ground.
6. All animals are made of cells.

Can You Tell?

Can you help each animal find its home? Number a page in your notebook from 1 to 5. For each animal, write the letter printed in front of its environment.

1. seal	A. forest
2. goat	B. desert
3. squirrel	C. sea
4. kangaroo rat	D. mountain
5. mole	E. ground

YOU CAN LEARN MORE ABOUT

How Animals Live

Animal Scenes

You will need one box for each environment that you make. Cut off the top and one long side of each box. Paint the inside of each box so it shows the environment. Make clay or pipe-cleaner models of the animals you have learned about. Put them in the right environment. You might want to put stones, twigs, sand, or leaves in the scenes.

Word Puzzle

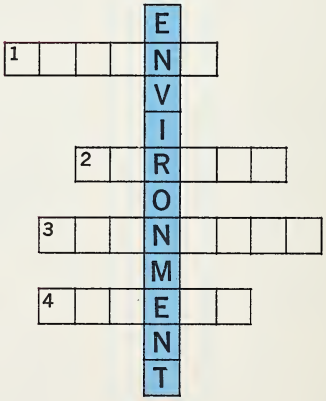
Read the sentences below. Look at the puzzle and write the word for each sentence in your notebook.

1. A mole can live in this kind of an environment.

2. There are many trees in this kind of environment.

3. Some goats can live in this kind of environment.

4. This is a hot, dry environment.



Make an Aquarium

An aquarium can help you learn about fish and their environment. To learn how to make a good aquarium, you should use good sources. Find a book that tells you how to build an aquarium. Ask your teacher to tell you the best place to put the aquarium. Ask the owner of a pet shop what food the fish will need. What kind of fish should you buy?

You Can Read

1. *The True Book of Animals of the Sea and Shore* by Illa Podendorf. Learn how sea animals live.

2. *See Through the Forest* by Millicent E. Selsam. Read how plants and animals live in the forest.

3. *Desert Dwellers* by Terry Shannon. See how the desert is a home for plants and animals.

5

Your Body's Needs

What You Will Find Out

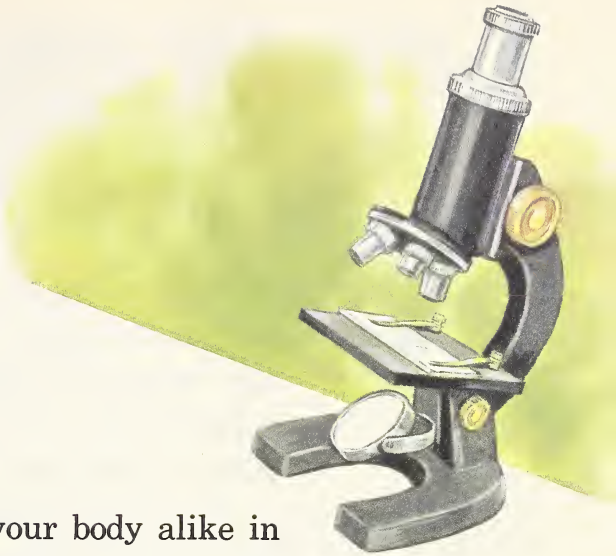
Eating, breathing, and getting rid of wastes are some of your body's needs. Knowing about your body and these needs will help you learn to take better care of yourself.

Your body has many parts. Each part is made of many smaller parts. You will learn more about these smaller parts. You will learn how they help to keep you alive and well.

What Are You Made Of?

Some parts of your body are hard, like your teeth. Some parts are soft, like your cheeks.

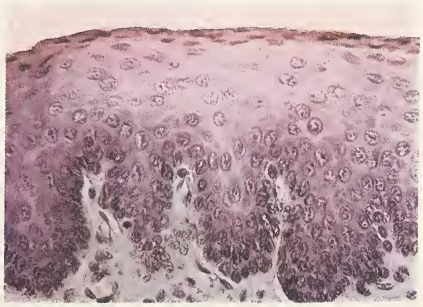
Some parts are long, like your legs. Some parts are short, like your fingers.



Are all of the parts of your body alike in any way? Scientists say *Yes.* All of the parts of your body are made of cells.

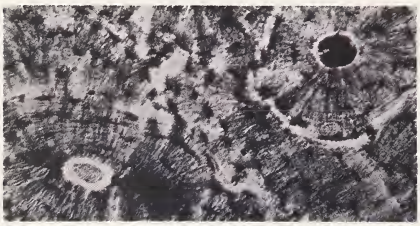
Scientists make use of **microscopes** (MY-kruh-skohps) to look at the cells of people's bodies. A microscope helps to make small things seem much bigger. A microscope is like a magnifying glass. It helps scientists to see very small things.

When scientists look through microscopes at skin cells, here is what they see.



Your **muscles** are the parts of your body that help you to move. All your muscles are made of cells. These cells are called muscle cells. Scientists can see muscle cells with a microscope.

Microscopes also let scientists see the cells that make up bones. Such cells are called bone cells.



All of the parts of your body are made of cells. There are millions of cells in your body. Your cells do many different kinds of work. Your skin, made of cells, helps to cover you. Your muscles, made of cells, help you to move. Your bones, made of cells, help to hold your body up.

USING THE SCIENTIST'S WAY

You can see some real cells. You will need a toothpick, some iodine, a glass slide, a cover slip, and a microscope.

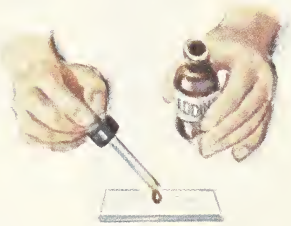
Gently rub the *flat* end of a toothpick against the inside of your cheek. Some of the cells of your cheek will come off on the toothpick.

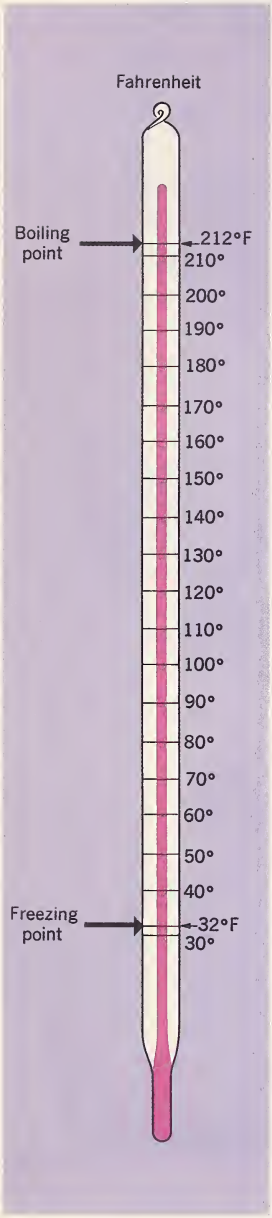
Put a drop of iodine on the glass slide.

Carefully dip the end of the toothpick into the drop of iodine. Some skin cells will come off in the iodine.

Cover the glass slide with a cover slip.

Look through the microscope at the skin cells. Draw a picture of what you see.





How Are All Your Cells Alike?

In one way, all your cells are alike. Every one of your cells helps keep you alive and well. All your cells work together to do this.

But your cells need some things to do their work. Your cells need food. Your cells need oxygen. Your cells need to get rid of wastes. Then your cells can work to keep you alive and well.

USING THE SCIENTIST'S WAY

When cells do work, they give off heat. You can show that the cells in your hand are giving off heat.

Get a **thermometer** (ther-MOM-uh-ter) like the one in the picture.

A thermometer shows how warm or how cold something is. Put the thermometer

on a desk in your classroom. Leave the thermometer on the desk for a few minutes.

Read the thermometer. It will show how warm the air in the classroom is.

Close your hand around the bulb of the thermometer. After a few minutes read the thermometer. The thermometer will show how warm your hand is. Does the thermometer show that your hand is warmer than the air in the room? What does this tell you about the cells in your hand?

Why Do Your Cells Need Food?

Every minute of the day and night, your cells are helping to keep you alive and well. And every minute that your cells are working, they are using up some **energy.** The energy is what makes your cells able to do their work.

Your body, like a machine, needs energy to do its work. A flashlight gets energy from a battery. An automobile gets energy from gasoline. Where do you get energy?

Your cells get energy from the food you eat. Foods have energy in them. All of the energy in foods comes from the sun.

But your cells cannot use the energy that comes right from the sun. Only green plants can use the energy that comes right from the sun. When you eat green plants, you get the energy that came from the sun.

When you eat the meat of animals, you also get the energy that came from the sun. Can you tell how?

USING THE SCIENTIST'S WAY

Make a list of all of the kinds of foods that you eat in one day. Then try to tell how you get some of the sun's energy from each of those foods. You might start like this:

MILK
You get energy when you drink milk.
Milk comes from a cow.
The cow gets the energy by eating grass.
The grass is a green plant.
The grass gets energy from the sun.

How Do Cells Get Energy from Food?

How do you think your cells get energy from the food you eat?

The food must be changed before it can be used. The food must be changed into a *liquid* before your cells can use it to make energy. The way that your body changes the food so your cells can use the food for energy is called **digestion** (dih-JESS-chun).

Digestion starts right after you put the food into your mouth. Digestion starts as soon as the food in your mouth gets wet. Why does digestion start in your mouth?

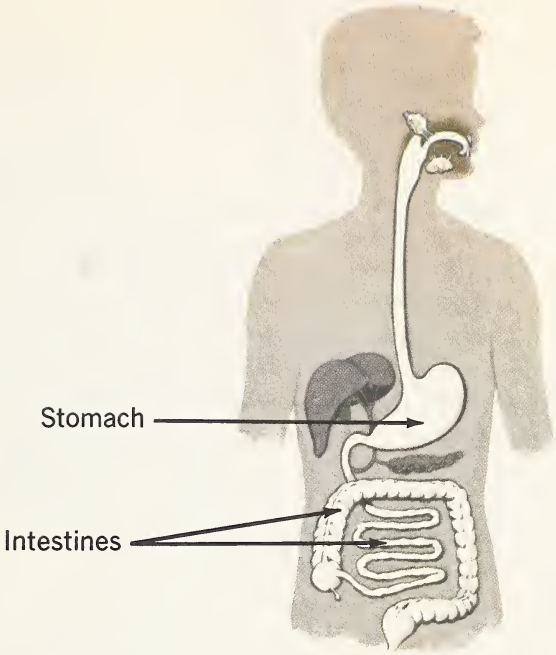
There is a liquid inside your mouth. This liquid is called **saliva** (suh-LY-vuh). More saliva comes into your mouth when you eat food and sometimes when you think about food.

You can feel the saliva in your mouth. Think about a food that you really like. Think about how good that food looks. Think about how good the food tastes. Remember how much you liked it the last time you ate it?

Can you feel the saliva coming into your mouth? Saliva is the liquid in your mouth that starts digestion. The saliva wets the food and helps to break it up.

Your teeth help to break up the food in your mouth. After your teeth have broken up the food into smaller pieces, the food you swallow goes down to your **stomach.**

The liquids in your stomach also help you digest the food.



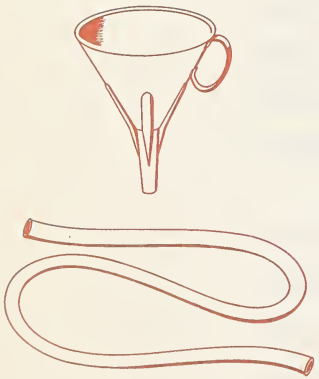
When the food leaves your stomach, the food is like a liquid. The food goes from your stomach to the part of your body called the **intestines** (in-TESS-tinz). The intestines look like a long curled-up tube. More digestion takes place in your intestines.

From your intestines, the digested food is carried to cells all through your body. How do you think the digested food gets from your intestines to the millions of cells in your body?

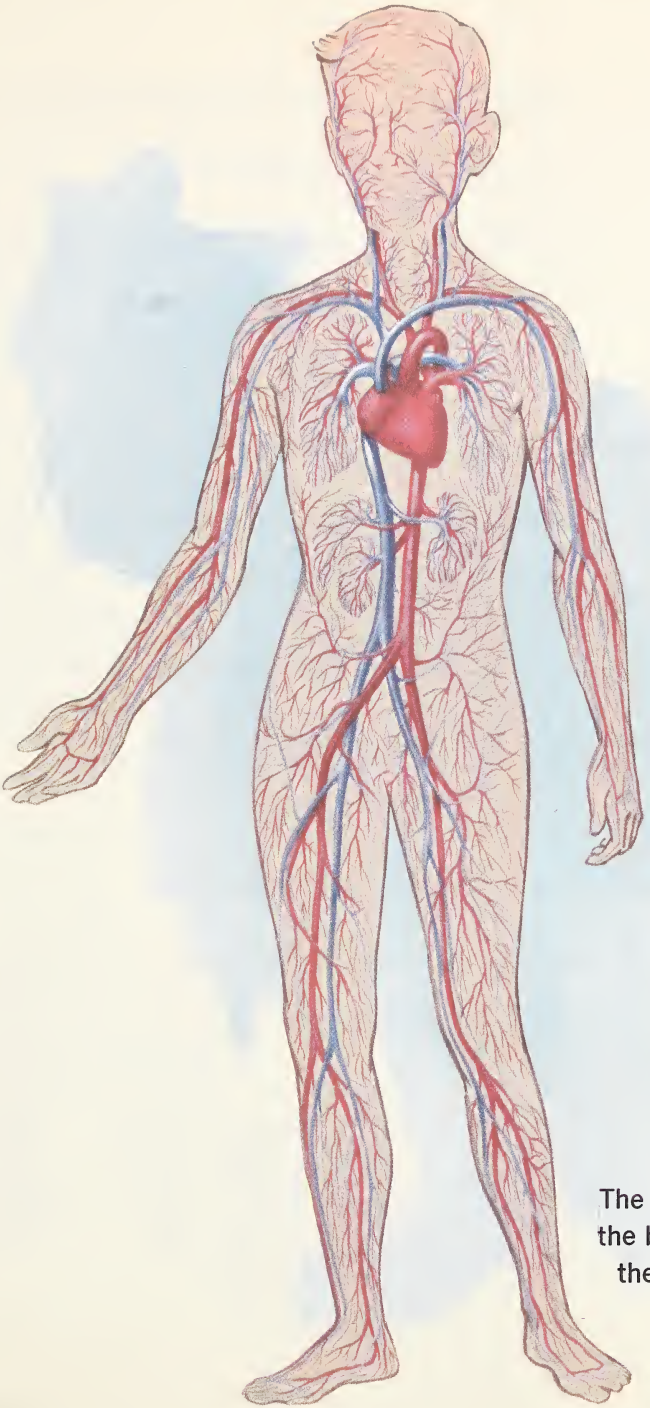
You know that there is **blood** inside your body. Your blood goes to every part of your body. It is like a train that moves along tracks. Your blood goes to every one of your living cells. Little by little, your blood carries the digested food from your intestines.

Here is a picture of the path your blood takes. Does your blood go to your hands? Does your blood go to your feet? Does your blood go to your head? Does your blood go to your arms and your chest?

USING THE SCIENTIST'S WAY



Make a model of the human body. Show the mouth and stomach. Show the intestines. You can use a funnel for the mouth. You can have a rubber hose go from the funnel to the stomach. What can you use for a stomach? What can you use for the intestines? Can you think of any way that you can show the heart? Can you think of any way that you can show the blood? How can you show the cells in your model?

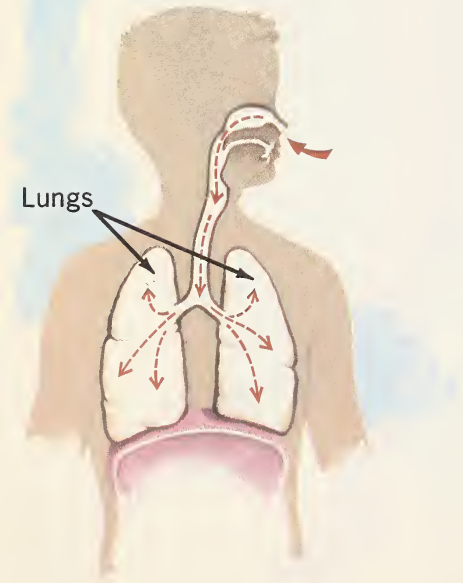


The path of the blood in the body

Why Do Your Cells Need Oxygen?

You know that your cells need food. Your cells must have food so they can get the energy they need. Your cells need the energy for you to stay alive and well.

You know that your cells also need air. Your cells need the oxygen that is in the air. The oxygen is a gas that you cannot see. The oxygen comes into your body with the air that you breathe. The oxygen helps your cells change the digested food into energy. Then your cells can do their work. This helps you stay alive and well.



USING THE SCIENTIST'S WAY

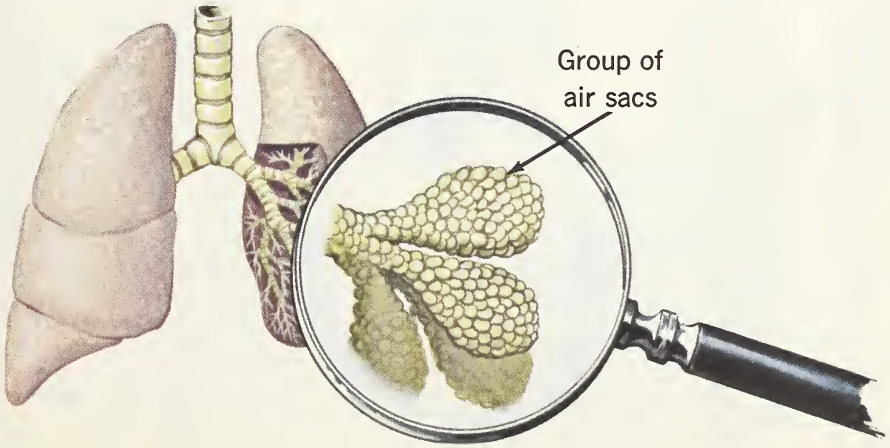
You can see that your cells need oxygen. Breathe out all your air through your nose. Then hold your breath. Try to count to twenty. Try not to breathe in air while you are counting. When you start breathing again, do you breathe harder than before? Can you tell why?

How Do Your Cells Get Oxygen?

Right now, as you breathe, air is coming into your body through your nose. There is oxygen in the air. Each time you breathe in some air, you are taking in some oxygen.

But how does the oxygen get to all the cells in your body? How do the cells in your toes, in your ears, in your nose, and in your fingers get the oxygen that they need to do their work?

First you breathe the air into your nose. The air then goes to your **lungs.** In your lungs the oxygen is taken out of the air. After your lungs take the oxygen out of the air, your blood carries the oxygen to the cells all over your body.



USING THE SCIENTIST'S WAY

Sometimes you do hard work. Then your cells work hard. When your cells work hard, they need much energy. You can see what happens when your cells need more energy. You can see what happens when you work hard.

Count the number of times in one minute that you breathe air in through your nose. Then jump up and down ten times. Again count the number of times in one minute that you breathe air in through your nose. When did you breathe more? Can you tell why?

How Does Your Body Get Rid of Wastes?

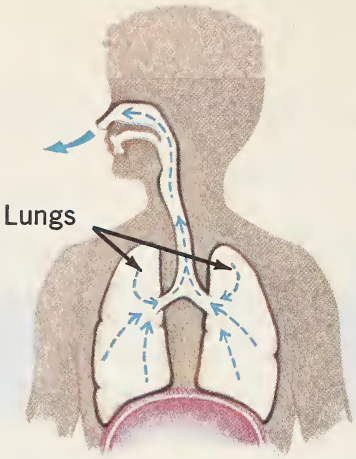
Most of the food that you eat is digested. But some parts of the food that you eat are not digested. These parts are called wastes. You get rid of these wastes when you go to the bathroom.

Your blood carries the digested food to your cells. To do work, your cells need energy. Even when you are very still, your cells need energy. As your cells turn the digested food into energy, they make a waste. The waste your cells make is a gas called **carbon dioxide** (KAR-bun dy-OK-syd). At this very minute, your cells are making carbon dioxide.

How does the carbon dioxide your cells make leave your body?

Carbon dioxide is carried away from the cells by the blood. Your blood carries the carbon dioxide from all your cells to your lungs. You know that you use your lungs when you breathe.

The carbon dioxide leaves your body each time you breathe out.



You cannot see carbon dioxide gas. How do you think scientists know that you are breathing out such a gas?

Scientists know that carbon dioxide will make the liquid called limewater turn cloudy. No other gas makes limewater turn cloudy. Scientists can use limewater to show that you are breathing out carbon dioxide.

USING THE SCIENTIST'S WAY

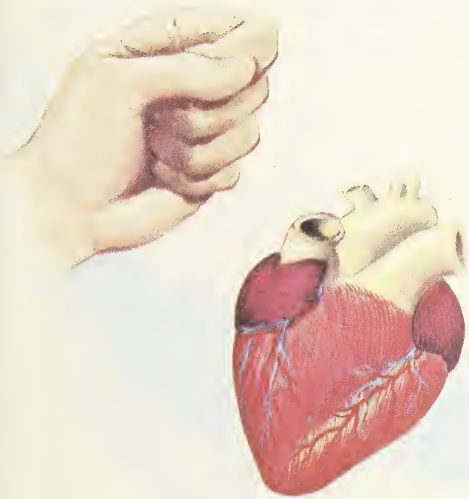
Buy some limewater at the drugstore. Blow through a straw into a glass of limewater. What happens to the limewater? Can you tell why?

How Does Your Blood Move?

Your blood is always moving through your body, even when you are asleep.

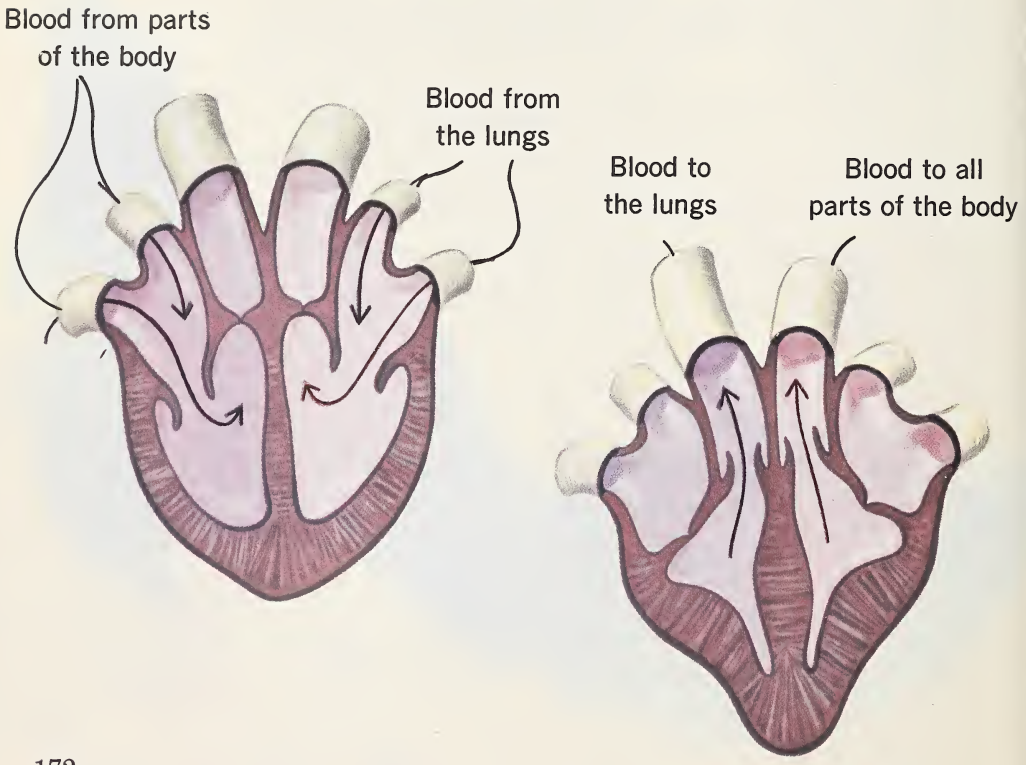
The part of your body that keeps your blood moving is called your **heart.** Your heart is a muscle in the middle of your chest that keeps your blood moving through your body as long as you live.

You can see how big your heart is. Close your hand. Your heart is about as big as your closed hand.



Look at the picture of a heart. Each side of the heart is like a pump. The right side pumps the blood to the lungs. The left side pumps the blood to the rest of the body.

The pumping action of your heart pushes your blood all through your body.



USING THE SCIENTIST'S WAY

You know that your cells need a great deal of energy when they work hard. To get more energy, your cells need more food and more oxygen. To get more food and oxygen to your cells, your blood moves faster through your body.

You can feel your blood moving through your body. Press two fingers against your wrist, as you see in the picture.

Your blood will feel like something that is tapping under your skin. The tapping that you feel is really your blood as it moves through one part of your body. Count the number of taps that you feel in your wrist in one minute.

Now jump up and down ten times. After, count the number of taps that you feel in your wrist in one minute.

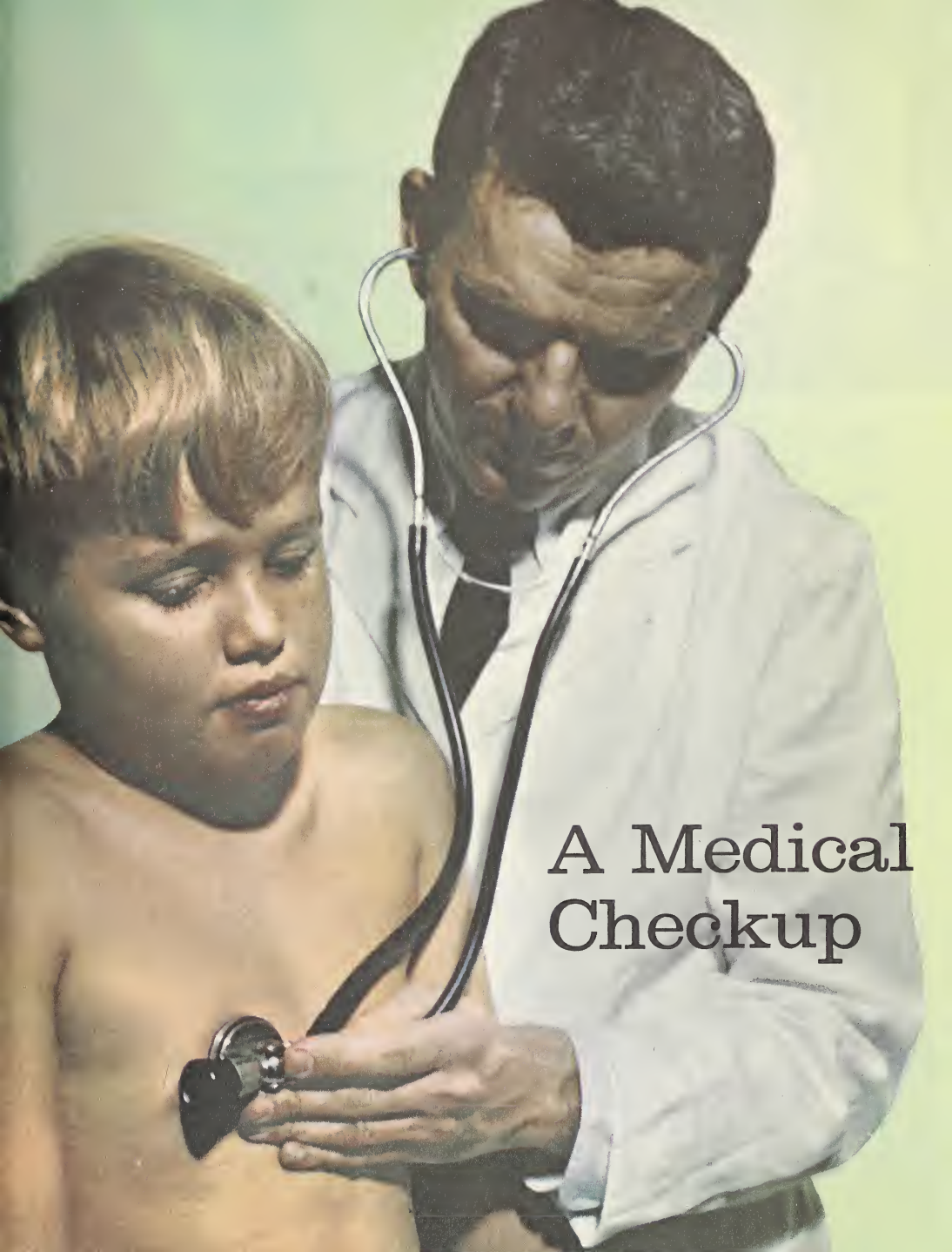
When were there more taps? Was your blood moving faster after you jumped up and down than before? Why?

ABOUT "A MEDICAL CHECKUP"

Science and health go hand in hand. Scientists' discoveries help the physician to understand and treat diseases. Some physicians do research themselves to find new forms of treatment.

You must do more than know about your body. It is also important for you to take care of your body and to see your doctor.

Taking care of your body means, among other things, seeing your doctor at least once a year for a medical checkup. Robert Preston is a third grader who knows it is important to have a medical checkup. Each year, Robert's parents make an appointment for Robert to see his doctor. This time, Robert agreed to let a photographer go along when he visited Dr. Jay Weiner. Dr. Weiner believes that if they knew more about a medical examination many more boys and girls would go to their doctors for checkups. So Dr. Weiner agreed to tell us about each step of his examination of Robert.

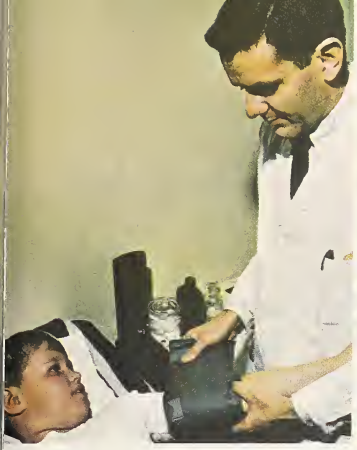

A Medical
Checkup

It's good to see you again.

Please tell me about anything that has been bothering you. After I bring your medical record up-to-date, we will go into the examination room.

First, the nurse will check your weight and height. I will enter that information on your medical record. Then we can see how much you have grown since you were here.

Now, I will feel your pulse. Do you wonder why I take your pulse with my first two fingers rather than with my thumb? The thumb has its own strong pulse; if I use my thumb, I may be feeling my own pulse.

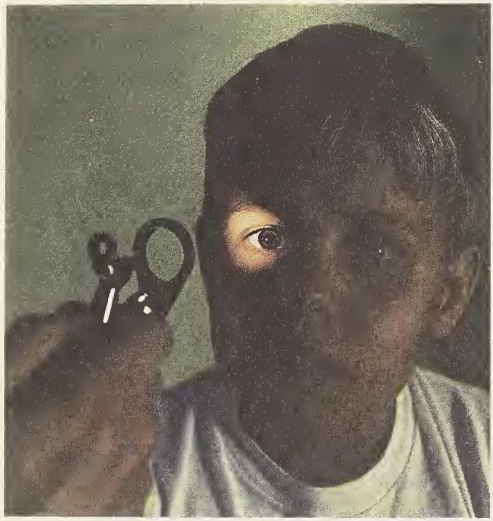


Next, I will take your blood pressure. First, I wrap this cuff around your arm. I then put the end of my stethoscope just below the cuff, over an artery in your arm.

I squeeze the bulb attached to the cuff to pump air into it. Do you feel the cuff getting tighter?

As I pump the bulb, the mercury in the gauge goes up. When the cuff is tight, it cuts off the blood supply to the artery in your arm, and I cannot hear anything. Now I let air out of the cuff. When the pressure in the cuff gets down to the level of the pressure in your artery, the blood pushes through your artery again. I first hear a hissing with each heartbeat when the pressure reaches 110 on the gauge. I know the pressure is the same as that in your bloodstream.

Now I let the air out of the cuff. Watch the mercury go down. As it reaches 70, the hissing sound disappears. This means the pressure in your arteries rises to 110 each time your heart beats and falls to 70 between beats. Your blood pressure is 110 over 70.



If you will sit on the edge of the table, I will examine your eyes, ears, nose, and throat. I will darken the room a little, so that I can use an instrument that will shine a tiny spot of light first into one eye and then into the other. With this instrument I can examine the blood vessels in the backs of your eyes to see how healthy they are. This is the only place in the body where a doctor can look at the blood vessels.

I will also shine a light into your eyes to see if the pupils of your eyes become narrower. If not, I will have to do more tests.

We'll turn the lights back on. I want you to follow the movement of my finger with your eyes. Good. Your eyes move the way they should. If I thought there were anything wrong, I would ask you to go to a doctor who is an eye specialist.

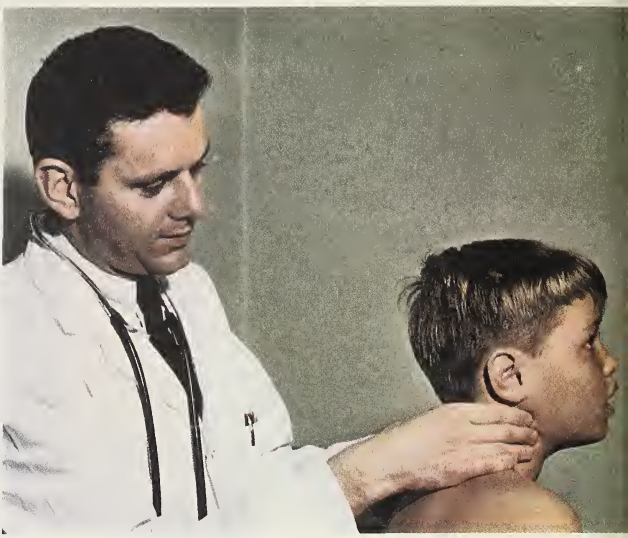
Let's look in your ears. With this instrument I can see your eardrums. Also, I will stand behind you and whisper some numbers to see if your hearing is good.

There are no signs of an infection in your nose.

I will now examine your teeth and tongue. I see you have been visiting your dentist. As you know, seeing your dentist is also important for your health. Say "Ahhh" so I can see into your throat.

You always see the doctor throw away the wooden stick that he placed in your mouth. Do you know why he throws away the stick?

Now it's time for you to take off your shirt so I can feel, or *palpate,* the glands on the sides of your neck and the glands underneath your arms. If any of the glands are enlarged it means that there may be an infection in that part of your body.



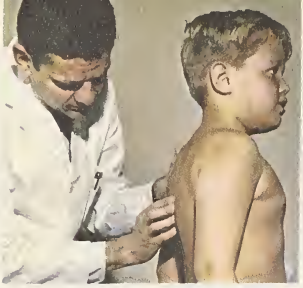
I try to feel your liver and spleen by pushing in on your skin.

Sit up. I will thump, or *percuss,* your back and your chest. I can tell from the sounds the thumping makes if anything is wrong in your chest, especially in your lungs.

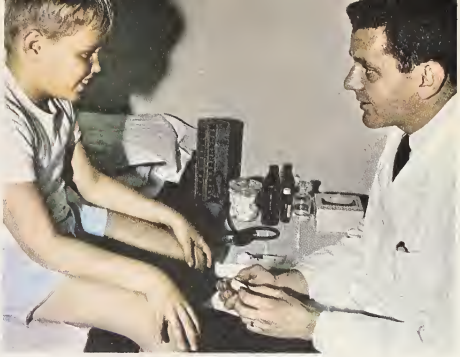
I shall use my stethoscope now to listen to your heart beating and to the sounds of your breathing.

A few more tests, and we will be finished. I want to check your nervous system. I start by tapping just below your kneecap to test your *reflexes*. A reflex is a movement, such as sneezing, over which you have no control. When I tap, your leg should and does kick out.

I do another test by scratching the soles of your feet with a point like the one on this key. See what happens: your toes curl down. If they did not, I would have to find out why.



Stand up. We will check your posture.



My medical records show that you need a tetanus booster shot. This little bottle is filled with tetanus vaccine, which I will inject into your arm. The injection takes only a few seconds, and the vaccine will protect you from tetanus. Children who have not had tetanus shots sometimes get the disease tetanus when they get cut while playing in the soil. The tetanus germs are found in the soil where cows and horses have been.

Your medical examination is over. It shows that you are in good health. You have done a good job of taking care of yourself. Your next medical checkup will be one year from today.

MORE ABOUT "A MEDICAL CHECKUP"

You have just followed step by step a medical examination of a child. Your own doctor may not follow the same order of steps. Perhaps your doctor will do more or fewer tests than Robert's doctor did. This is because your doctor knows *you*, and just what you need for *your* medical checkup.

Each time you have a checkup, your doctor keeps a record of everything he has found out about you. Over the years, this record serves as your medical history. If you see your doctor regularly, he can sometimes find and treat a disease before it becomes serious. He can also help to prevent diseases.

Now that you have learned more about a medical checkup, ask yourself these questions:

1. When did I last have a checkup?
2. Is it time for another one?
3. How am I making use of what I have learned to take care of my body?

You, your parents, and your doctor share the job of keeping you in good health. But your doctor cannot do his part unless you see him at least once a year for your checkup.

William Harvey

(1578–1657) ENGLAND

William Harvey was an English medical doctor who worked in the seventeenth century. Before this, most people did not question what they were told by a few wise men. But in Harvey's time, the people wanted to find out themselves. Learned men then began to do experiments to find answers to the questions that they had.

Harvey was doctor to King James I and then to King Charles I of England. King Charles let Harvey use the royal deer parks for his experiments.

Harvey wanted to know how the heart works and how the blood flows through the body. He studied heartbeats of many animals—pigs, dogs, snakes, frogs, and fish. He found that at one point in the heart's action it gets smaller. When the heart becomes smaller, blood is pushed into tubes

connected to the heart. These tubes, which we call **arteries** (AR-ter-eez), go to all parts of the body. The heart acts like a pump.

Harvey saw that the blood comes into the heart from other tubes, which are called **veins.** Harvey did a simple experiment. He cut an artery in an animal. The blood flowed from the artery. Harvey examined the dead animal and found that there was no blood in the animal's veins. This led Harvey to the idea that blood makes a complete trip around the body. The same blood that leaves the heart through the arteries must return to the heart through the veins and be pumped around again and again. We call this movement the **circulation** (ser-kyoo-LAY-shun) of the blood.

What Harvey learned about the circulation of the blood is one of the greatest discoveries in science. People no longer had to wonder how their hearts worked. Now they knew.

Using What You Have Learned

1. A doctor uses a **stethoscope** (STETH-uh-skohp) to listen to your heart and find out if it is well.

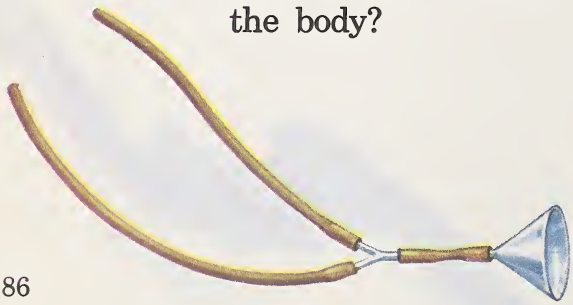
You can make a stethoscope. Get a funnel, some rubber tubing, and a Y-shaped tube such as you see in the picture.

First cut off a small piece of tubing and put it over the end of the funnel.

Next, put the Y-shaped tube into the other end of the tubing.

Then cut the rest of the tubing in half. Put one piece over each arm of the Y-shaped tube.

To use the stethoscope, have someone hold the funnel hard against the skin over his heart. Then put the ends of the tubing into your ears. Can you hear his heart beating as the heart pumps blood through the body?



2. Use the library to find pictures of animals' hearts. You might try to find pictures of a fish's heart, a dog's heart, and a bird's heart. How are these hearts the same? How are they different?

3. Your class can visit a museum of natural history. There you can see what the parts of the body look like. You can see what a heart looks like. You can see what the lungs look like. You can see how the blood goes all through the body.

WHAT YOU KNOW ABOUT

Your Body's Needs

What You Have Learned

Your cells need food so that they will have the **energy** to do work.

Digestion is the way your body changes the food you eat so your cells can use it. Digestion is started by **saliva** in your mouth. The food goes to your **stomach** and then to your **intestines,** where it is broken up still more. Your **blood** carries the digested food from your intestines to your cells.

When you breathe, air goes to your **lungs,** where the oxygen is taken out.

When cells use food, they give off a waste called **carbon dioxide.** Your blood carries the carbon dioxide to your lungs, and then you breathe it out.

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

digestion	heart	microscope	stomach
energy	lungs	muscle	thermometer

Matching Tests

Can you match the sentences with the pictures?

1. It helps you to move.
2. It pumps your blood.
3. They take the oxygen out of the air.
4. It helps digest the food you eat.

Guess the Words

Number a page in your notebook from 1 to 7. Write on your paper the words that fit the sentences below.

1. The way that food is turned into a liquid is called ___?___.
2. When you eat, a liquid comes into your mouth. The liquid is called ___?___.
3. Food goes from your stomach to your ___?___.
4. Your ___?___ carries the digested liquid food from your intestines to your cells.
5. Your cells give off a waste called ___?___.
6. Your cells need ___?___ to be able to do their work.
7. The part of the food that is not used by your cells is ___?___.

YOU CAN LEARN MORE ABOUT

Your Body's Needs

Guess the Word

1. Your cells need this to do their work.

2. A waste that is made in your cells.

3. A gas that comes into your body every time you breathe in some air.

4. All of the parts of your body are made of these.

5. Digestion starts as soon as food comes into this part of your body.

REENGY

BARONC EXIDDIO

NEXGOY

SELCL

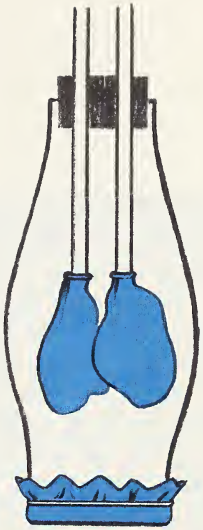
THOUM

Watching Your Blood Pumped

Stick a drawing pin into the middle of a wooden match. Hold your hand out, with the underside of your wrist up and flat. Place the head of the pin on your wrist so you can see the match move each time that your blood is pumped by your heart.

Make a Lung Model

Use some rubber sheeting to cover the end of a chimney lamp. Use a rubber band or string to hold the sheeting. Attach two balloons to two pieces of tubing fitted through a two-hole rubber stopper. Put the stopper into the top of the lamp. The balloons are like your lungs. See what happens to the balloons when you push and pull the sheeting.



You Can Read

1. *What's Inside of Me?* by Herbert Zim. Learn about your body.

2. *Your Body and How It Works* by Patricia Lauber. Learn how your body works.

3. *Wonders of the Human Body* by Anthony Ravielli. See how you move.

6

Food for Life

What You Will Find Out

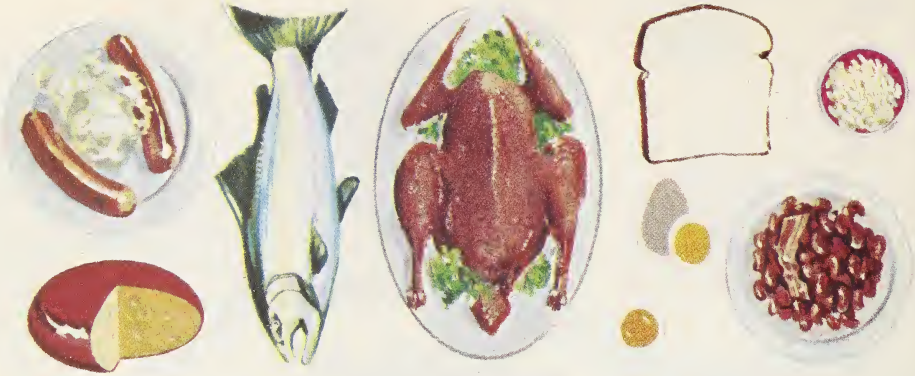
Eating certain foods is important in keeping healthy. You will find out about the foods you need. You will learn about what is being done to get more and better food for all people.

Do you think cake and soda make a good lunch? You probably know that they do not. But do you know why? Do you know why you need to eat certain foods every day?

Are All Foods the Same?

Look at this school lunchroom. See the boys and girls eating here. Can you tell which boys and girls are eating a good lunch? Why do you think those foods make up a good lunch?

These are some foods you may like to eat. Do you think all of these foods are alike in any way? All these foods have **nutrients** (NOO-tree-ents) in them. Nutrients help you to grow. They help you to have energy. There are six kinds of nutrients that your body needs. Each has a special job to do.



One of the nutrients is called **protein** (PRO-tee-in). You need proteins to help you grow. Here are some foods that have much protein in them. What foods do you see?

Another nutrient is **fat.** You get some of the energy you need when you eat fat. The picture below shows foods that have fat in them. Can you name them?

Still another nutrient is **carbohydrate** (kar-boh-HY-drayt). This nutrient also gives you energy. But your body can digest carbohydrates faster than it can digest fat. The foods in the picture are rich in carbohydrates. Can you name them?

Your body needs three other nutrients. They are **minerals, vitamins,** and **water.**

Minerals help you to grow well. Vitamins keep the parts of your body working well. Water helps to digest food and carry the food and oxygen to your cells. Water helps to carry wastes from your cells.

Some foods have all six nutrients in them. But most foods have only some nutrients in them. You should eat many different kinds of foods to get all the nutrients that you need.

Your body, like a machine, needs fuel to work. Foods are the fuel for your body.

USING THE SCIENTIST'S WAY

Starch is a carbohydrate. You can use iodine to see if a food has starch in it. Iodine turns blue-black when mixed with starch.

Fill two glasses with water. With a medicine dropper, slowly add some iodine to one glass. Does the water turn blue? Is there any starch in the water?

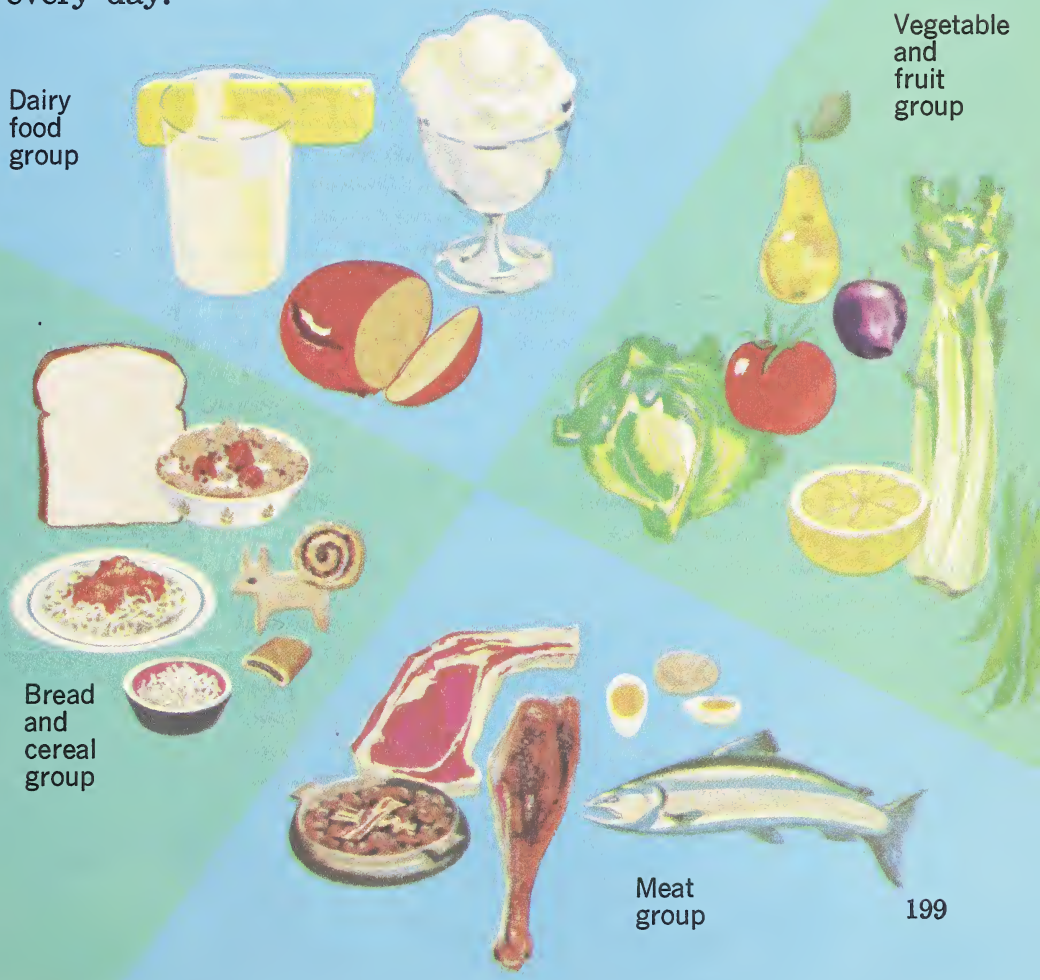
Now put some corn starch in the other glass of water.

With the medicine dropper, slowly add a few drops of iodine to this glass of water. What happens? What does this show?

Try to see if other foods have starch in them. What foods can you test?

What Foods Should You Eat Every Day?

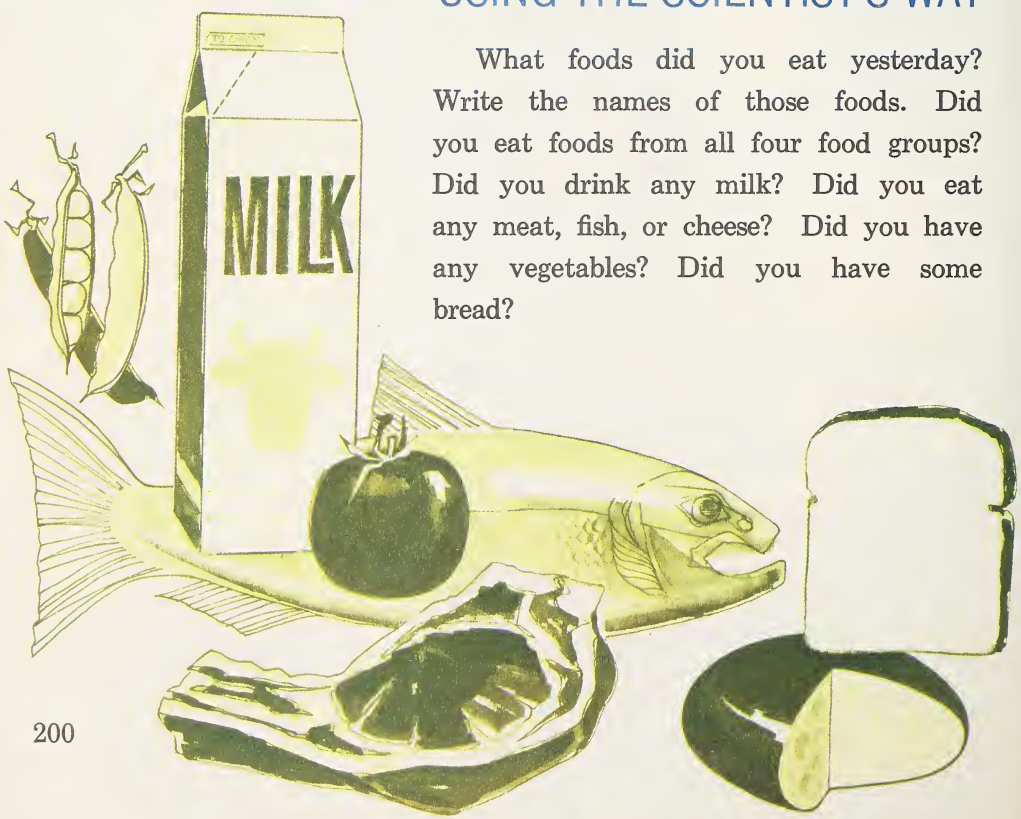
Food scientists say there are four food groups. You get the nutrients you need if you eat enough food from each group every day.



You get proteins and fats from foods in the meat group and in the milk group. You get carbohydrates from foods in the vegetable-fruit group and the bread-cereal group. And all foods in the four groups have some vitamins, minerals, and water in them.

USING THE SCIENTIST'S WAY

What foods did you eat yesterday? Write the names of those foods. Did you eat foods from all four food groups? Did you drink any milk? Did you eat any meat, fish, or cheese? Did you have any vegetables? Did you have some bread?



Are All Foods Good for You?

How are all these foods alike?

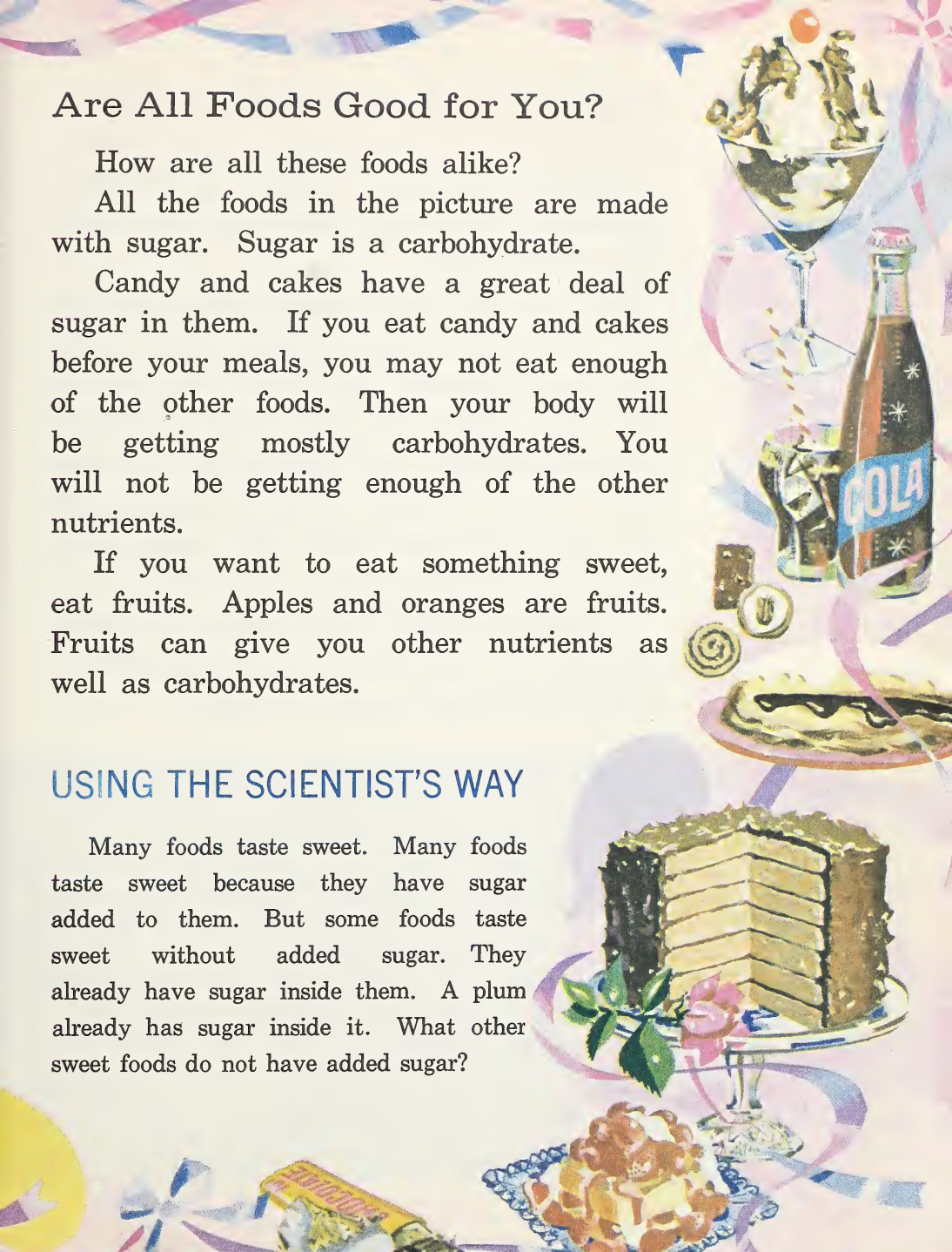
All the foods in the picture are made with sugar. Sugar is a carbohydrate.

Candy and cakes have a great deal of sugar in them. If you eat candy and cakes before your meals, you may not eat enough of the other foods. Then your body will be getting mostly carbohydrates. You will not be getting enough of the other nutrients.

If you want to eat something sweet, eat fruits. Apples and oranges are fruits. Fruits can give you other nutrients as well as carbohydrates.

USING THE SCIENTIST'S WAY

Many foods taste sweet. Many foods taste sweet because they have sugar added to them. But some foods taste sweet without added sugar. They already have sugar inside them. A plum already has sugar inside it. What other sweet foods do not have added sugar?

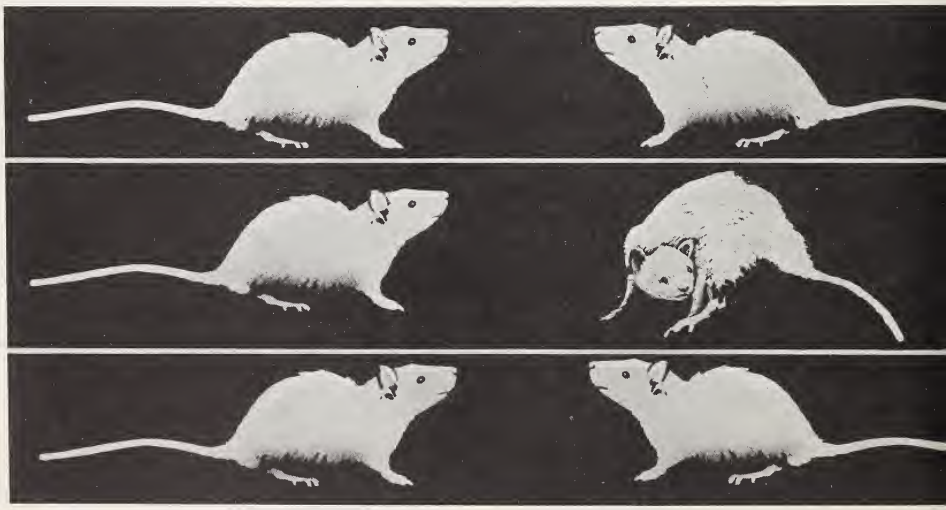


Why Do You Need Vitamins?

There are many kinds of vitamins. Scientists have done experiments to learn more about them.

To see what vitamins do, scientists did an experiment with healthy rats. The scientists fed some rats foods with all the vitamins. They fed other rats foods that had none of the vitamin called B_1. These second rats got sick. Then the scientists gave the sick rats foods with vitamin B_1. Soon the sick rats were well again.

Scientists learned from this and other experiments that people need many different kinds of vitamins to stay healthy.



Long ago many sailors got the sickness called scurvy. The sailors got this sickness when they went on long ocean trips. Sailors with scurvy had sore gums. Their teeth fell out. The sailors were very weak. They were too sick to work. Some sailors even died from scurvy.

Why did so many sailors get scurvy? Scientists found out that "something" in fruits stops people from getting scurvy. And sailors had no fruits to eat on their long trips. The meat and bread that the sailors ate gave them some vitamins, but not the one that stops scurvy.

Today scientists know that each vitamin plays a part in keeping people healthy.

USING THE SCIENTIST'S WAY

You can find out more about the vitamins in foods. Visit a food store. Look at the boxes and cans of foods. Look at some milk, some orange juice, and some raisins. Can you find the names of any vitamins printed on the boxes or cans of these foods? Can you find the names of vitamins printed on the boxes or cans of other foods?

Why Do You Need Minerals?

You need minerals so that the parts of your body will grow well. Minerals help your bones and teeth to grow well.

One mineral is called **calcium** (KAL-see-um). You need calcium so that your bones and teeth can grow hard and strong. Milk has much calcium in it. You get the calcium that you need when you drink enough milk.

Touch your forehead. Do you feel the hard bone?

Touch your elbow. Can you feel the hard bone there?

Breathe in deeply and feel your ribs. They are also made of hard bone.

Touch your wrist. Can you feel the hard bone in your wrist?

Touch the front of your leg. Do you feel the hard bone in your leg?

Touch your teeth. Are they as hard as your bones?

Calcium keeps your bones and teeth strong.

USING THE SCIENTIST'S WAY

You can see what happens to a bone that has lost its calcium.

Feel a chicken bone. Put it in a jar. Pour vinegar over the bone to cover it.

After about a week, the vinegar will have taken the calcium out of the bone. Wash the bone with water. What does the bone feel like now? Is the bone strong and hard? How would *your* bones and teeth feel if they did not have calcium in them? What would happen?

Why Do You Need Water?

Your body needs water for many things. Without water, you could not stay healthy. Without water, you could not live for more than a few days.

Many parts of your body have liquids in them. These liquids have a great deal of water in them.

Your saliva is a liquid. A large part of your saliva is water. Your saliva helps to wet and digest the food that you eat.

There are also liquids in your stomach and intestines. The liquids in your stomach and intestines have much water in them. These liquids also help you digest the food that you eat.

You know that your blood is a liquid. Your blood has a great deal of water in it. Water is what makes your blood a liquid. A liquid flows. If your blood were not a liquid, it could not carry food and oxygen to your cells. If your blood were not a liquid, it could not carry wastes away from your cells.

USING THE SCIENTIST'S WAY

Without water, food could not get into your cells. There is a great deal of water in your blood. Your blood is a liquid. Because your blood is a liquid, it is able to carry nutrients. These nutrients pass out of the blood into spaces between the cells that are filled with other liquids. These liquids carry the nutrients to your cells. The nutrients pass through the cell membranes into the cells.

You can see that nutrients will not pass into a cell without water. Fill a glass halfway with water. Then put a straw in the glass.

Loosely cover the top of the glass with a paper towel, as in the picture.

Let the straw stick out through the towel. Be careful not to tear any other holes in the towel.

Make believe that the towel is a cell membrane and the water in the glass is the inside of a cell.

Put a tablespoon of sugar on the towel. Do not let any sugar fall into the water.

Sip a little water through the straw. Does the water taste sweet?

Now carefully put some drops of water on the sugar. Use enough water to make many drops go through the towel into the glass.

Again, sip a little water through the straw. Does the water taste sweet now? What does this tell you?

Food For All

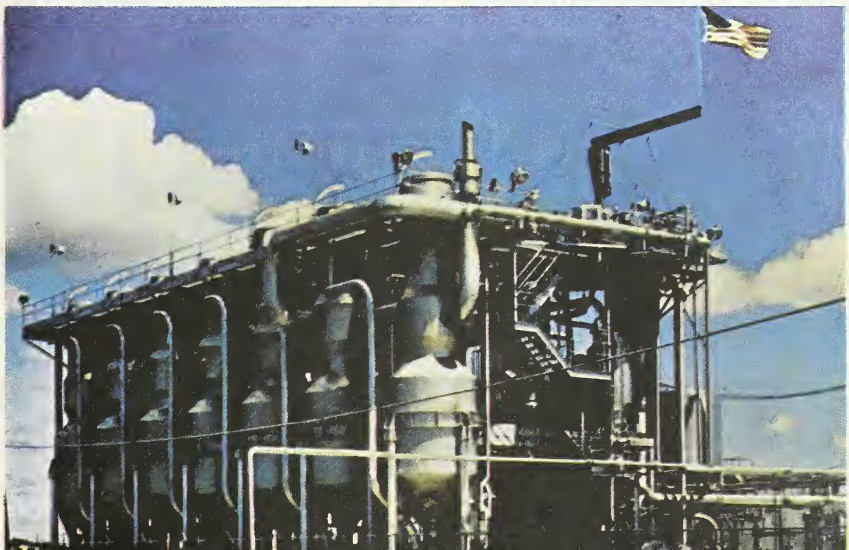
You have learned that people need food to live. You also have learned that you must eat enough of certain *kinds* of foods to be healthy. Is there enough food for everyone on earth? Is there enough of all kinds of foods for everyone on earth?

There are more than three billion people on earth today. Next year there will be many more people than this year. The number of people on earth will keep growing every year. How will all these people get enough of the right kinds of foods to eat? Where will their food come from?

Today most people in the United States can get enough of the right kinds of foods. But as more and more people are born in this country, more food will be needed. In most countries more food is needed right now.

What is being done now to get more food? What plans have been made for new ways to do this?

As you know, water is one of the six nutrients. People must have fresh water to drink. People must have water to grow plants. There is not enough water in many places for all man's needs. How can the people on earth get more fresh water? One way is to keep the water in rivers and streams clean by not dumping wastes into them. A second way is to plant forests and let them grow. The roots of the trees in the forests hold much fresh rain water in the soil. Why is this important? A third way is to change some of the salt water in the sea into fresh water. Scientists are trying these and other ways to get more fresh water.



What is being done to get enough of all kinds of foods for all the people? Many people do not have enough food because the land on which food grows is not being used in the best ways. People in many places still have no machines to help them farm. The farmer in the first picture below does not have tools to farm the land quickly and well. The farmer in the next picture is using a tractor. With a tractor and other machines, he can farm more land than he could without machines.

Some people do not have enough food because the land is too dry. Scientists are finding ways to bring water to dry land so food can be grown on it. In the picture above, you can see a farmer working land that used to be dry. The land is now watered.

Some land needs more minerals than it now has, for food to grow on it. People are learning what minerals to add to the soil and how to add them.

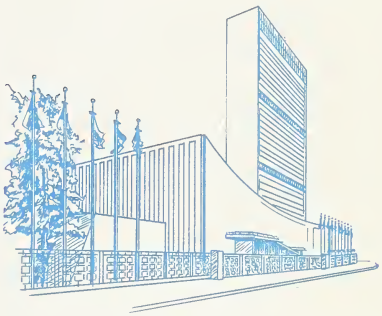
Many people in the world cannot get enough of the nutrient called protein. Fish and other living things in the sea have much protein in them. Scientists are finding ways to get and use more food from the sea. In the picture above, you can see machines being used to unload fish.

A group that is teaching people these and other ways to get more food and fresh water is the Food and Agriculture Organization of the United Nations. This group helps people of all countries. It teaches people what to do and helps them to get what they need to do things to get more food.

USING THE SCIENTIST'S WAY

You can find out about the work of the Food and Agriculture Organization. You can find out by looking in books from the library and by writing to the United Nations.

When you do this, you will learn more about why some people do not have enough of the right kinds of foods. You will learn more about what people in other countries eat and why they eat this way. Your class can make an exhibit called "How the Food and Agriculture Organization Helps People Get More Food." Your exhibit can be about four or five countries.



UNITED NATIONS

Joseph Goldberger

(1874–1929) UNITED STATES

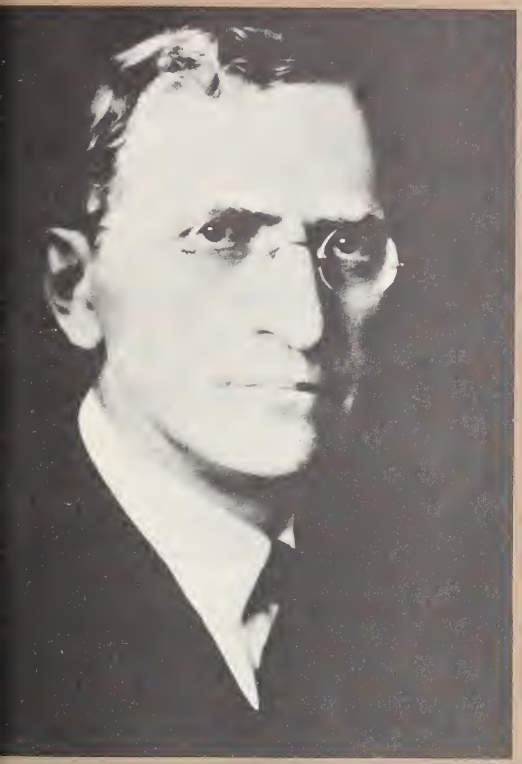
In 1914, Dr. Joseph Goldberger, of the United States Public Health Service, was given the job of finding the cause of a disease that was taking thousands of lives every year. This disease was called **pellagra** (puh-LAY-gruh).

For many years, scientists had not been able to find the cause of pellagra. Some scientists thought this disease was caused by a germ. They believed this because many people with pellagra had a skin rash.

Rather than just guess at the cause of pellagra, Dr. Goldberger set about *finding out* its cause. He visited hospitals, orphanages, and prisons, places where there were many cases of pellagra. In the hospitals, he found that the doctors, nurses, and attendants never got pellagra. If pellagra were caused by a germ, it would seem that the doctors, nurses, and attendants would catch it.

Dr. Goldberger also noticed something else. He noticed that at mealtime the doctors, nurses, and attendants got the best cuts of meat. They also got milk to drink. The patients did not get milk or good cuts of meat. Dr. Goldberger decided to see if the cause of pellagra had something to do with food.

Dr. Goldberger was on the right track. At an orphanage he learned that only children between the ages of six and twelve got pellagra. Why? These children were not given milk or meat. To test his idea that something missing from the diet causes pellagra, Dr. Goldberger gave the children milk and fresh meat. A year later,



there was not one case of pellagra in the orphanage.

But many scientists still believed that pellagra was caused by a germ. Dr. Goldberger did more experiments. He put twelve volunteers on a diet that had no fresh greens, meat, or milk. They all developed pellagra. To get more evidence, Dr. Goldberger injected himself and five other people with blood from a woman sick with pellagra. Not one person got the disease.

Dr. Goldberger had proved again and again that a lack of certain foods, not a germ, causes pellagra. Sometimes it takes many years to prove an idea. And then it may take many more years to prove to other scientists that the idea is correct. This is all part of being a scientist.

Using What You Have Learned

1. You may want to invite a food scientist to talk to your class. There are food scientists in many universities. You might ask your librarian to help you find out if there are any food scientists who work near your school.

Before you invite the food scientist to your class, write some good questions about food. You can ask the questions after the talk.

2. Your class might visit a food market or a farm. Try to find out what happens to food after it is grown. Try to find out how food is sent to the food store.

3. You can start a vegetable garden. Use books from the library to find out how to grow vegetables. You can also learn how to grow vegetables by asking the people at a garden store.

4. Write the names of ten foods, such as cream cheese, whole-wheat bread, and green beans. Try to find out which nutrients you get from these foods. Use good sources to find out. You can also look again at pages 196-197.

WHAT YOU KNOW ABOUT

Food for Life

What You Have Learned

All foods have **nutrients,** which help you grow, help your body work well, and give you energy. The six nutrients are **proteins, fats, carbohydrates, minerals, vitamins,** and **water.** You get the nutrients you need when you eat enough foods from each of the four food groups every day.

Food must be found for all the people on the earth. Scientists are helping people to get more of the right kinds of foods. The Food and Agriculture Organization of the United Nations is working with scientists and other people to find ways to grow more and better food.

Checklist of Science Words

Here are some science words you read about in this unit. Can you tell what you have learned about each one?

calcium	fat	pellagra	vitamin
carbohydrate	mineral	protein	water
chemical	nutrients	starch	

Food Groups

Write the names of the four food groups on a page in your notebook. List each food in its own food group.

fish	butter	cooky	tomato
cheese	steak	banana	spaghetti
oatmeal	grapefruit	milk	egg
lettuce	pancake	chicken	ice cream
orange	potato	hamburger	lemon

Using Science Words

Number a page in your notebook from 1 to 4. Fill in the right word for each sentence.

carbohydrate mineral protein water

1. There is much ___?___ in foods such as cheese and meat.

2. The nutrient ___?___ helps to give your body the energy you need.

3. Calcium is a ___?___ that helps parts of your body to grow well.

4. The nutrient ___?___ helps digest food and make up your blood.

YOU CAN LEARN MORE ABOUT

Food for Life

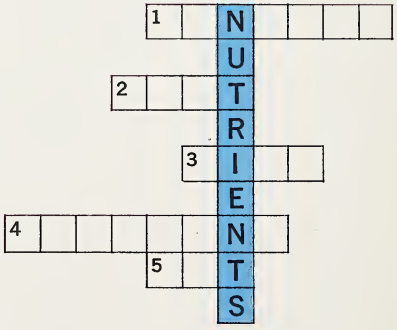
Test for Vitamin C

You can find out what foods have vitamin C in them. Mix 10 drops of boiled starch with 1 drop of iodine in half a glass of water. The water will change color. Do you remember how iodine changes the color of starch? If you add a food that has vitamin C in it, the color of the water will change again. Add some orange juice. How does the color change?

Word Puzzle

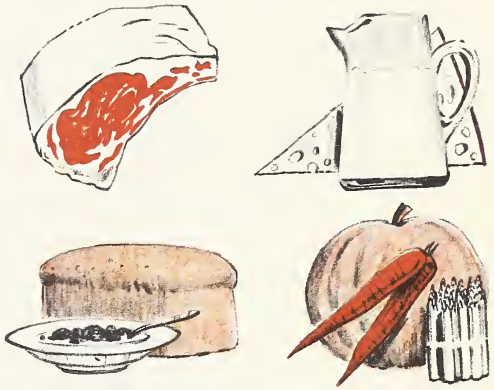
Read the sentences below. Then look at the puzzle. Can you guess the word for each sentence?

1. Calcium is one of these.
2. Fish is in this food group.
3. Ice cream has this in it.
4. They help your body work.
5. This nutrient is found in butter.



Planning a Menu

Plan a menu for three meals a day. Do not forget the four food groups. Have at least one food from each group in each meal that you plan. Cut out pictures to show the different foods you pick. Below each picture, write the food group for that food.



You Can Read

1. *The Plants We Eat* by Millicent E. Selsam. This book tells about the parts of the plants that people eat.

2. *The Wonderful World of Food* by John Boyd Orr. Read how food has been grown since very long ago.

3. *Your Food and You* by Herbert Zim. Learn more about the best kinds of foods and how they help you to grow and stay well.

Do You Remember?

Living things are plants or animals. All living things—plants and animals—are made up of *cells*. A cell has a covering, called a *cell membrane,* around it. A plant cell has a *cell wall* around the cell membrane, and an animal cell does not.

All animals are alike and different from plants in other ways, also. Animals cannot make their own food, and most animals cannot grow new parts. Animals can move about, and most plants cannot.

All animals must eat, take in air, and get rid of wastes. But there are ways in which animals are different from each other. Because of these differences, animals are *adapted* to live in certain kinds of *environments*—deserts, forests, mountains, the water, and in the ground.

Your body, like that of all animals, is made of cells. Different kinds of cells make up your *muscles, bones,* and *skin.* Your cells work together to keep you alive and well.

The food you eat gives your cells *energy* to do their work. The way your body changes the food so your cells can use it for energy is called *digestion.* Food is digested by the *saliva* in your mouth and by liquids in your *stomach* and your *intestines.* Your blood helps carry the digested food toward your cells.

Your cells also need *oxygen* to do their work. There is oxygen in the air you breathe in. The air goes from your nose to your *lungs.* Your blood carries the oxygen from your lungs to your cells.

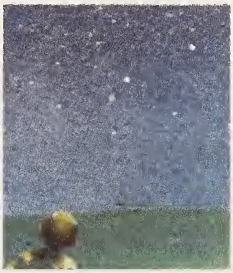
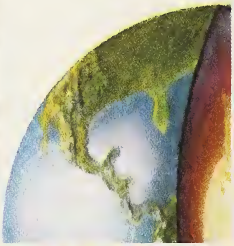
Your cells have to get rid of the wastes they make. One such waste is *carbon dioxide.* Your blood carries these wastes from your cells to your lungs. The carbon dioxide leaves your body when you breathe out.

Your *heart* pumps your blood, carrying food, oxygen, and wastes, through your body.

All foods have *nutrients* in them. *Proteins* and *minerals* are the nutrients that help you grow. *Fats* and *carbohydrates* are the

nutrients that give you energy. *Vitamins* are nutrients that keep the parts of your body working well. *Water* is a nutrient you need for the liquids in your body. You get the right nutrients if you eat enough food from each of the four food groups every day.

Some people in the world do not have enough of the right kinds of foods to eat. Scientists are looking for ways to get food for these people. The Food and Agriculture Organization of the United Nations is working with the scientists and other people to help solve the food problem.

Dictionary of Science Words

A

adapted animal (uh-DAP-ted). An animal that is able to stay alive in its environment. (p. 109)

algae (AL-jee). Small green sea plants, which scientists believe were among the first living things on earth. (p. 74)

amphibian (am-FIB-ee-un).

An animal that lives part of its life in the water and part on the land. Amphibians started living after the first land animals. (p. 76)

artery (AR-ter-ee). A tube that carries blood away from the heart. (p. 185)

astronaut. A person who travels in spacecraft. (p. 50)

axis (AK-siss). The make-believe line that goes through the middle of the earth from north to south. (p. 36)

B

bathysphere (BATH-ih-sfeer). A large hollow metal ball that carried William Beebe and another scientist down into the sea. (p. 144)

Big Dipper. The group of stars that looks like a big pan with a long handle. (p. 44)

blood. The liquid inside your body that carries food and oxygen to your cells and the carbon dioxide wastes from your cells. (p. 164)

brain. The part of an animal's body that helps the animal to learn. Man has a large brain and one with many ridges compared with the brains of many animals. (p. 83)

C

calcium (KAL-see-um). A mineral that makes your bones and teeth strong. (p. 205)

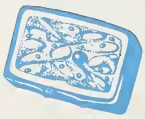
carbohydrate (kar-buh-HY-drayt). A nutrient that gives you energy. (p. 197)

carbon dioxide (KAR-bun dy-OK-syd). The waste gas that is made by your cells as they use digested food to get energy. Your blood carries the carbon dioxide to your lungs. (p. 169)

cell(s). The very small living parts that make up all plants and animals. (p. 104)

cell membrane (MEM-brayn). The covering around a cell. (p. 105)

cell wall. The covering around the cell membrane in a plant cell. (p. 105)



circulation (ser-kyoo-LAY-shun). The movement of the blood through the body. (p. 185)

cold-blooded animal. An animal whose body temperature changes as the temperature of the animal's environment changes. (p. 112)

constellation (kon-stuh-LAY-shun). A group of stars that looks like a picture in the sky. (p. 44)

crust. The outside layer of the earth. (p. 71)

D

digestion (dih-JESS-chun). The changing of food by your body so your cells can use the food. (p. 161)

dinosaur (DY-nuh-sor). A very large reptile that started living on earth after the first mammals did. (p. 78)

discovery. A new answer to a question. (p. 17)

E

ellipse (ih-LIPSS). The shape of the orbits of planets and the moon. (p. 32)

energy. The ability to do work. Your cells need energy to do work. (p. 159)

environment (en-VY-run-ment). The place where an animal lives. (p. 88)

experiment (ik-SPEHR-uh-ment). A way of looking for an answer by trying things out. (p. 15)

F

fat. A nutrient that gives you energy. (p. 196)

G

galvanometer (gal-vuh-NOM-uh-ter). A special instrument used to see if there is electricity moving in something. (p. 21)

generator (JEN-uh-ray-ter). A machine that can make electricity. (p. 21)

gravity (GRAV-uh-tee). The earth's strong pull. (p. 51)

H

heart. The part of the body that pumps the blood through the body. (p. 171)

I

inner core. The deepest layer of the earth. Scientists think that the inner core is solid nickel and iron. (p. 72)

intestine (in-TESS-tin). The part of the body to which food goes as it leaves the stomach. The small intestine, in which much digestion takes place, looks like a long curled-up tube. (p. 163)

L

liquid. Matter that flows. Water is a liquid. (p. 72)

Little Dipper. The constellation that looks like the Big Dipper but smaller than the Big Dipper. (p. 44)

lung(s). The part of your body where oxygen is taken out of the air you breathe in. The oxygen then goes into your blood. (p. 167)

M

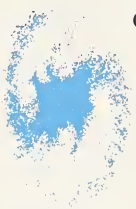
mammal (MAM-ul). Animals that started living millions of years after the first reptiles. All mammals have hair on their bodies. Most mammals have babies that are born live. The babies get milk from their mothers' bodies. (p. 77)

mantle. The layer of the earth under the crust. Scientists think the mantle is hard rock. (p. 72)

matter. Anything that takes up space. (p. 67)

microscope (MY-kruh-skohp). An instrument used to help make small things seem much bigger. (p. 155)

Milky Way Galaxy (GAL-ak-see). The galaxy of which our solar system is a part. A galaxy is made up of billions of stars. (p. 33)



mineral. A nutrient that helps you to grow well. (p. 197)

moss. A small green plant that grows well in rocky places. (p. 120)

muscle (MUSS-ul). A part of the body that helps you to move. (p. 156)

N

Neanderthals (nih-AN-der-thalz). Men who lived in caves thousands of years ago. (p. 85)

nocturnal animal (nok-TER-nul). An animal that is active at night. (p. 115)

North Star. One of the stars in the Little Dipper. (p. 44)

nutrient (NOO-tree-ent). Something you need for growth and energy. (p. 195)

O

orbit (OR-bit). The path of one object around another, such as the path of the earth around the sun. (p. 31)

outer core. The layer of the earth under the mantle. Scientists believe the outer core is a very hot liquid. (p. 72)

oxygen (OK-sih-jun). A gas that is part of the air. Oxygen enters your body each time you breathe in some air. (p. 107)

P

pellagra (puh-LAY-gruh). A disease people get when they do not eat enough of certain kinds of foods. (p. 216)

planet (PLAN-it). One of the nine bodies that orbit the sun and get their light from the sun. (p. 32)

planetarium (plan-uh-TAIR-ee-um). A place where a machine makes the ceiling look like the sky. (p. 35)

protein (PRO-tee-in). A nutrient that helps you grow. (p. 196)

R

reflect. To bounce back. The moon reflects sunlight. (p. 41)

reptile (REP-til). An animal with scales on its body. Most reptiles slide along the ground or walk on four short legs. Reptiles started living after the first amphibians. (p. 76)

rocket. A type of spacecraft that man sends into the sky. (p. 49)

S

saliva (suh-LY-vuh). The liquid in the mouth, which helps digest food. (p. 162)

satellite (SAT-uh-lyt). A spacecraft in orbit. (p. 50)

scale(s). The small flat layers or pieces of skin on a fish's or reptile's body. (p. 76)

scorpion (SKOR-pee-un). A land animal that started living after fishes. (p. 75)

solar system (SOH-ler). The sun and its planets. (p. 32)

source. Anything that helps you to find answers to questions. (p. 9)

spider. A land animal that started living after fishes. (p. 75)

sponge. A sea animal that started living long after the first algae. (p. 74)

stethoscope (STETH-uh-skohp). An instrument that a doctor uses to listen to your heart. (p. 186)

stomach. The part of the body where food goes after you swallow it. (p. 162)

T

telescope (TELL-uh-skohp). An instrument that makes faraway things seem much closer. (p. 34)

thermometer (ther-MOM-uh-ter). An instrument that shows how warm or how cold something is. (p. 158)

trilobite (TRY-luh-byt). A small sea animal that started living after the first sponges, jellyfish, and worms. (p. 75)

U

universe (YOO-nuh-verss). The total of everything that there is. (p. 34)

V

vein. A tube that carries blood back to the heart. (p. 185)

vitamin (VY-tuh-min). A nutrient that keeps the parts of the body working well. (p. 197)

W

warm-blooded animal. An animal whose body temperature always stays about the same. (p. 113)

water. A nutrient that you need for the liquids in your body. (p. 197)

Dictionary of Scientists

Here is a list of the scientists you have read about in this book.

Agassiz, Louis (AG-uh-see). A Swiss doctor, interested in earth science, who was the first to say that there had been a great ice age. (p. 90)

Beebe, William (BEE-bee). The American scientist who built the bathysphere, in which he and others could plunge deep into the ocean. He reported on many animals that men had never seen before. (p. 144)

Copernicus, Nicolaus (koh-PER-nih-kuss). The Polish astronomer who, in 1543, wrote that the earth turns on its axis and orbits the sun. (p. 52)

Faraday, Michael. The English scientist who discovered that a moving magnet can produce electric current in a wire. His discovery led to the invention of the electric generator. (p. 20)

Goldberger, Joseph. A doctor who proved that pellagra is caused by a lack of certain kinds of foods. (p. 216)

Harvey, William. The English doctor who showed that the heart pumps the blood from the arteries to the capillaries to the veins and back to the heart. (p. 184)

Checklist of Science Activities

Here is a list of some things you can learn to do as you read this book. At the end of each unit there are four pages that tell you other things you can do.

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